

# Medfusion 2001 Syringe Pump

## OPERATIONS MANUAL



### **Warning: ECMO Use**

Do not use on the inlet side of Extracorporeal Membrane Oxygenation (ECMO) systems as the high negative pressure could result in uncontrolled fluid flow.

P/N G6000597



**medexinc<sup>®</sup>**

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P/N 9-61-20000-0-6  
Revision 6  
October, 1996

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# Operations Manual For Medfusion 2001 Syringe Pump

*(Software Versions 1.4\* and 1.4A\*)*

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\* Note: The software version on the pump may display a third digit that is consistent with a software update that does not affect the operation of the pump and is invisible to the user. Please call Medex if the first or second digit on the pump does not correspond to this manual.

This product is compliant with the requirements for Electromagnetic Compatibility (EN60601-1-2) per Council Directive 89/336/EEC. The CE mark is applied to this product when destined for Europe to indicate compliance.



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2001 OPERATIONS MANUAL



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# SECTION I

## INTRODUCTION

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The Medfusion 2001 syringe pump provides a continuous or intermittent delivery whenever meticulous low volume drug or fluid injections using a syringe are required in the hospital. All medications should be delivered in accordance with their approved drug labeling.

**IMPORTANT:** Clinical discretion should guide the use of this syringe pump and associated disposables. Considerations should include, but not be limited to, the medication or fluid to be administered, its stability, its compatibility, and its pharmacologic response to environmental conditions. Consult with the syringe manufacturer, medical literature, drug package inserts and other available sources for additional information on syringe/medication interactions.

A unique feature of the Medfusion 2001 Syringe Pump is the custom program mode which allows preselection of certain infusion modes and parameters. Thus, the custom program mode accommodates programming to meet a specific need. Those needs are customized by selection of the number/type of infusion modes, the maximum infusion rate, the alarm volume, the alarm temporary delay time, volume limit, KVO rate, and alarm types. Additionally, this mode offers the health care professional and biomedical engineer a lockout feature which limits access to assure programming reliability.

The Medfusion 2001 Syringe Pump holds a full complement of disposable syringes (e.g., 1 through 60 ml). See General Specifications for details on manufacturers. The **SYRINGE MANUFACTURER** and **RATE** are programmed prior to initiating delivery. For convenience, if desired, the **SYRINGE MANUFACTURER** can be "custom programmed." The **SYRINGE SIZE** is automatically selected. The Model 2001, with its state-of-the-art design, is easy to program and monitor while administering infusions.

The Model 2001 has four infusion modes: continuous infusion, volume over time, intermittent automatic, and intermittent manual. The continuous mode is programmed in milliliters per hour. The volume over time mode has parameters of volume in milliliters and time in hours and minutes. The intermittent automatic and manual modes include parameters of volume to be delivered, the delivery time in minutes, and the time between deliveries in hours and minutes. The pump automatically delivers the next dose or alarms when the next delivery is due. (The alarm, however, only occurs when the pump is programmed for all alarms.)

# INTRODUCTION

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## **CAUTION**

In consideration of how syringe pumps operate, clinicians should consider use of appropriate syringe, tubing, and in-line devices for the given application and the drug being infused. Certain factors enhance multiple characteristics of syringe pump infusion such as time to detect an occlusion, visual verification of volume delivered, continuity of flow, time to reach the set rate. Following are considerations requiring discretion by clinicians using syringe pumps. (Typically, this is most important with continuous injections of short half-life drugs.)

- a. Select the smallest syringe size appropriate for the intended application. Friction within the syringe (between the plunger rubber tip and the barrel) can affect the continuity of flow and the time required to attain the set infusion rate; the plunger tip expands and relaxes throughout the infusion, particularly with larger syringes at slower rates. The best case is to use smaller syringes at higher rates.
- b. Do not use a 60 cc syringe for rates of 2.0 cc/hour or less. Such use is generally not recommended when using a syringe pump.
- c. Connect the syringe pump tubing at the closest point to the patient for more predictable and accurate delivery of the fluid.
- d. Use small internal diameter, high durometer (hardness) tubing and no in-line devices for best results at low rates.



## **CAUTION:**

Federal (USA) law restricts this device to the sale by or on the order of a physician.



## **WARNING:**

Carefully read the entire contents of this manual including Section XI, Precautions, before attempting to use the Medfusion 2001 Syringe Pump, and verify that the SOFTWARE VERSION of the pump and manuals are in agreement.



## SECTION II

# GENERAL SPECIFICATIONS

<b>Overall Size</b>	4.5" wide X 3.0" high X 7.5" long
<b>Weight</b>	2.5 pounds
<b>Accuracy</b>	± 3%, excluding syringe variations
<b>Infusion Modes</b>	Continuous, Volume Over Time, Intermittent Auto, Intermittent Manual
<b>Flow Rate</b>	00.01 to 378.0 ml per hour dependent upon syringe size selected. (see Appendix I)
<b>Syringe Selection</b>	<p><b>Version 1.4 — Five Options (4 Manufacturers):*</b></p> <p>Becton-Dickinson (B-D) 1, 3, 5, 10, 20, 30, 60ml  Monoject (MONO) 1, 3, 6, 12, 20, 35, 60 ml  Terumo (TERU) 1, 3, 5, 10, 20, 30, 60 ml  Becton-Dickinson Glass (BD-G) 1, 3, 5, 10 ml  Abboject (ABOT) 50 ml</p> <p><b>Version 1.4A — also includes 3 additional syringe manufacturers:*</b></p> <p>Braun (BBM) 2, 5, 10, 20, 30, 60 ml  Fresenius (FRES) 10, 50 ml  Perfusor (PERF) 50 ml</p> <p><i>Also has the ability to accept other manufacturer's syringes upon special request.</i></p> <p><i>Automatically senses syringe size except for B-D 1 cc Luer-lock syringe (see Appendix IV).</i></p>
<b>Syringe Fill Volume</b>	All syringe sizes will fill to maximum stated volumes
<b>Power</b>	AC95-135V; 60HZ DC-Internal rechargeable batteries International voltages available
<b>Recharge Time</b>	With Pump Off: 16 Hours at 25 degrees C
<p><i>*The following are trademarks: B-D (by Becton Dickinson and Company), Monoject (by Sherwood Medical), Abboject (by Abbott Laboratories) and Perfusor (by B.Braun).</i></p>	

## **GENERAL SPECIFICATIONS continued...**

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### **Battery Capacity**

At 25 degrees C, a 16 hour charge will operate the pump for at least 10 hours at 5.0 ml per hour with a 60 ml syringe.

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### **Alarms/Alerts**

Near Empty  
Empty  
Volume Limit  
Occlusion  
System Malfunction  
Low Battery  
Depleted Battery  
Syringe Pops Out  
Invalid Size  
Invalid Number  
Check Clutch  
Stop/Program  
Deliver  
Battery In Use  
Battery Charging  
Battery Depleted/Plug in AC  
Priming  
Standby Mode

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### **Total Volume Delivered**

000.00 to 999.99 ml increments of 0.01 ml

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### **Volume Limit**

00.00 to maximum capacity of syringe size (with minimum programmable volume of 0.05 ml in increments of 0.01 ml).

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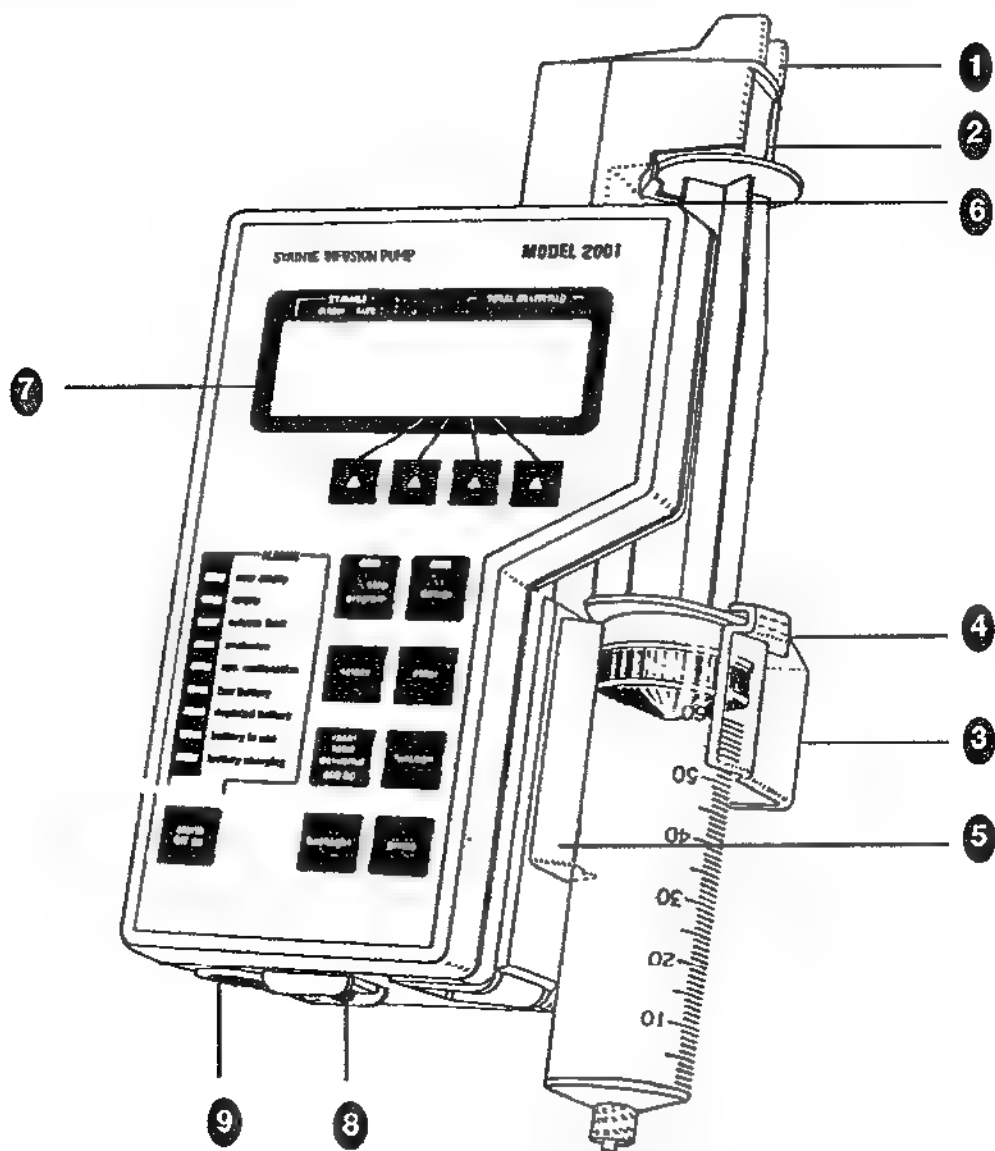
### **KVO**

0.1 to 9.9 ml per hour in increments of 0.1 ml (cannot exceed primary rate)

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## SECTION III

# GENERAL DESCRIPTION/DIAGRAM



1. .... CLUTCH LEVER
2. .... SYRINGE DRIVER
3. .... SYRINGE CLAMP (CLEAR)
4. .... SYRINGE CLAMP GROOVE (RETAINER)
5. .... SYRINGE SADDLE
6. .... SYRINGE PLUNGER RETAINER
7. .... LCD
8. .... ON/OFF SWITCH
9. .... CHARGING RECEPTACLE

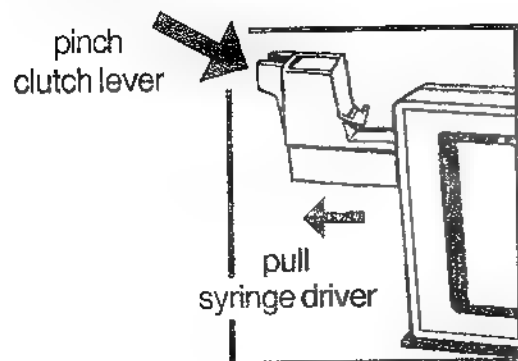
# SECTION IV

## OPERATING INSTRUCTIONS

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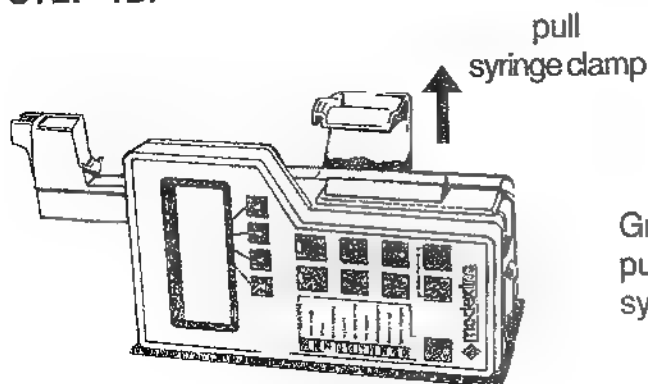
### STEP 1: SYRINGE LOADING

#### STEP 1A:



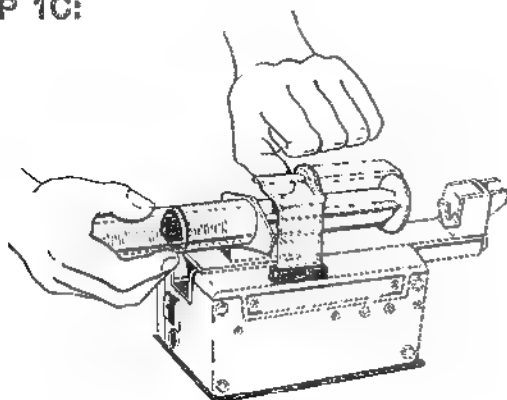
Pinch and hold together the **CLUTCH LEVER** (releases the clutch) and pull the **SYRINGE DRIVER** outward until it reaches the end of its track.

#### STEP 1B:



Grasp the clear **SYRINGE CLAMP**, pull upward allowing room for the syringe in the **SYRINGE SADDLE**.

#### STEP 1C:



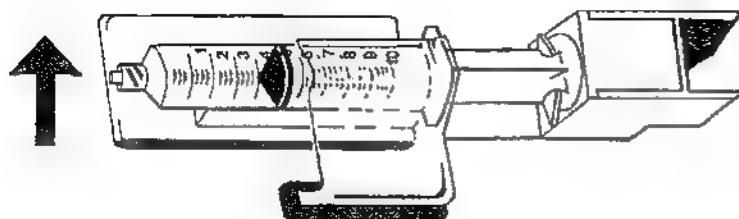
Insert the syringe, plunger end first.

## OPERATING INSTRUCTIONS *continued...*

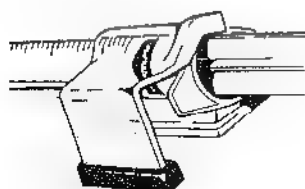
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### STEP 1C continued:

**NOTE:** To be certain that the syringe is properly placed in the pump, make sure the graduations/numbers on the syringe face up.

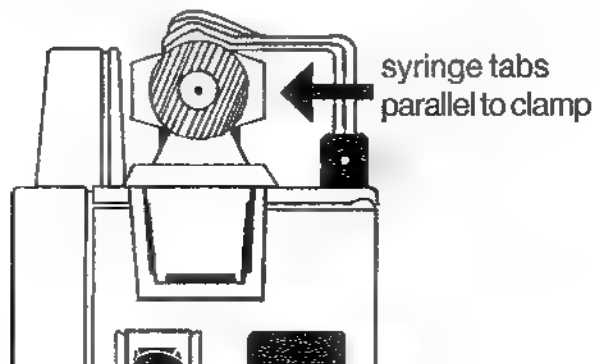
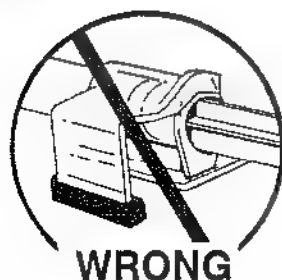


### STEP 1D:



The clear syringe clamp must secure the syringe tabs within the syringe clamp groove. Syringe tabs can be rotated slightly.

Finger tabs should be parallel in relation to the clamp as shown:



If not properly engaged, the pump may alarm after it has been in the deliver mode for a period of time.



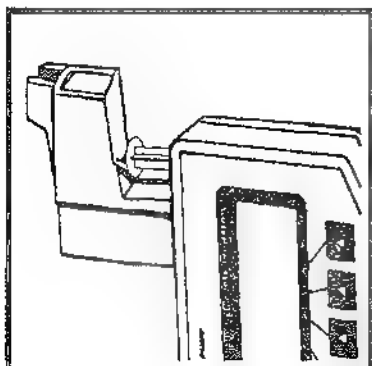
### **CAUTION:**

For all syringe sizes, be sure the finger tabs of the syringe are correctly engaged in the syringe clamp groove (retainer) and the syringe saddle.

## OPERATING INSTRUCTIONS *continued...*

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### STEP 1E:



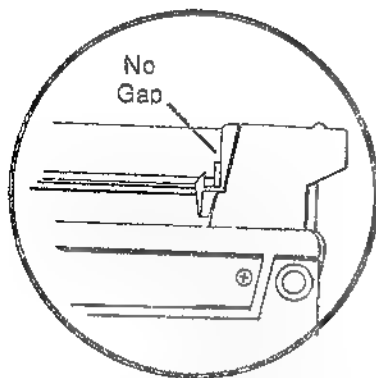
Pinch together the CLUTCH LEVER and move the SYRINGE DRIVER forward until the SYRINGE DRIVER contacts the plunger end of the DISPOSABLE SYRINGE.



#### **IMPORTANT:**

Make sure the CLUTCH LEVER snaps into its fully extended operating position.

### STEP 1F:

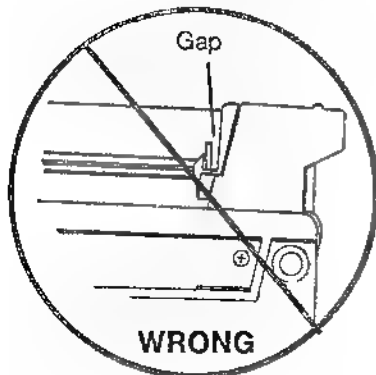


Insert the end of the SYRINGE PLUNGER into the SYRINGE PLUNGER RETAINER thus holding it in place. The SYRINGE PLUNGER may need to be lifted to load.



#### **WARNING:**

Failure to secure the syringe plunger to the plunger retainer may result in siphoning, causing overdelivery.

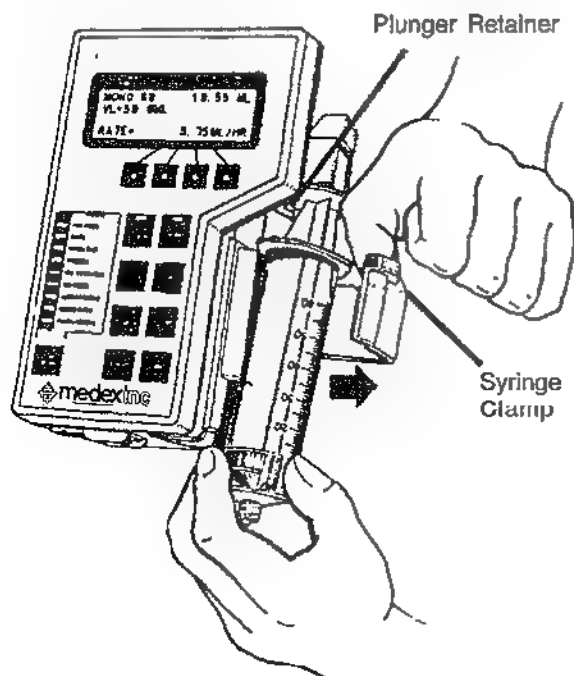


#### **CAUTION:**

The plunger must be in contact with the driver to begin immediate delivery. A gap could lead to a delay in delivery. Use the prime function to eliminate any gap.

# OPERATING INSTRUCTIONS *continued...*

## STEP 1G: REMOVING THE SYRINGE:

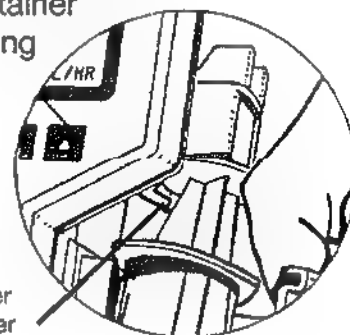


To remove syringe from pump: Lift up the clear syringe clamp and remove the empty syringe as shown.



### **IMPORTANT:**

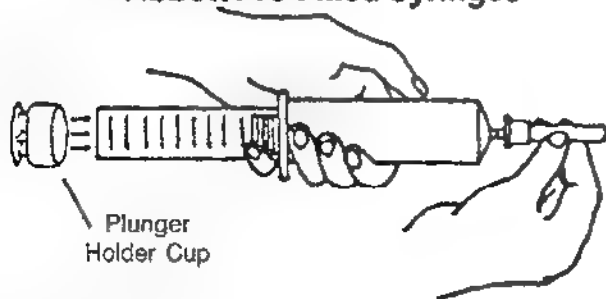
Be sure to lift the syringe plunger out of the plunger retainer (groove) before pulling the syringe out.



### **WARNING:**

Failure to follow proper syringe removal procedures could cause damage to your pump, which may result in inaccurate drug delivery.

## STEP 1H: **OPTIONAL** Loading Abbott Pre-Filled Syringes



- Securely attach the plunger holder cup provided by Abbott to the end of the syringe plunger. (Glue or tape must be utilized to securely attach the plunger holder cup).
- Place the end of the cup into the plunger retainer as described in STEPS 1E and 1F.



### **WARNING:**

Proper syringe loading and plunger holder cup placement is essential for proper delivery and actuation of the empty and near empty alarms. Improper use or the lack of use of the plunger holder cup may result in inaccurate drug delivery. Failure to secure the plunger holder cup to the syringe may result in siphoning, causing over-delivery.

## OPERATING INSTRUCTIONS continued...

### STEP 2: TURNING THE PUMP "ON"; REVIEWING THE CUSTOM PROGRAMMED FEATURES AND PUMP SELF TEST.

**STEP 2A:** The main power switch is located on the end of the pump. Switch it to the "ON" position (i.e., 0=Off, 1=On). **NOTE:** Make sure the power cord is plugged into an electrical outlet (unless battery power is required).

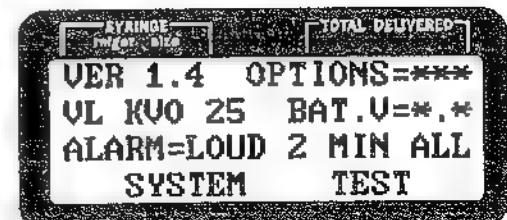
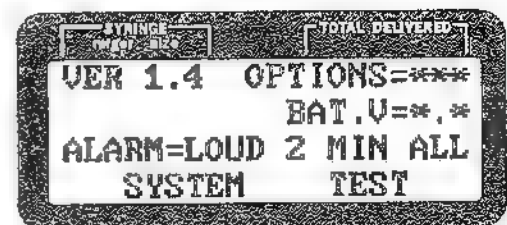
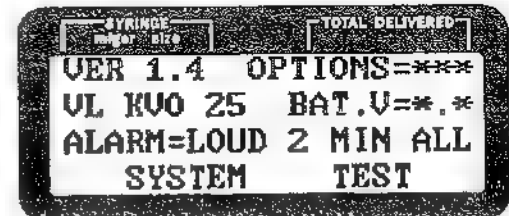
When "ON," the LCD (Liquid Crystal Display) displays the following information:

Line 1 - Software version and a three digit number that defines the custom program options.

Line 2 - A VL indicates a VOLUME LIMIT was custom programmed. A KVO indicates a KVO was custom programmed and a two digit number indicates MAXIMUM FLOW RATE for the continuous mode was custom programmed. The BATTERY VOLTAGE appears as a two digit number.

**NOTE:** A blank LCD for VL, KVO and MAXIMUM FLOW RATE as shown indicates these features have not been custom programmed.

Line 3 - Alarms as custom programmed appear. The first choice is either LOUD or SOFT, the second is the TEMPORARY ALARM DELAY TIME which is either 2 MIN or 1 HR, and the third is ALARM OPTIONS which is either ALL or SOME.



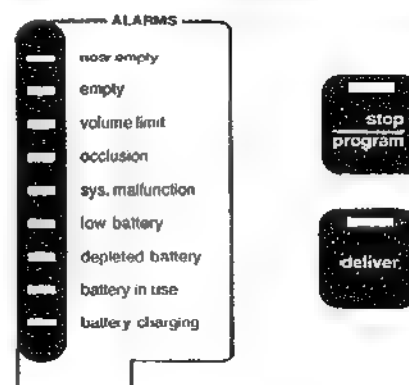
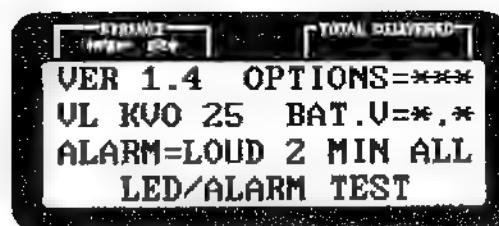


# OPERATING INSTRUCTIONS continued...

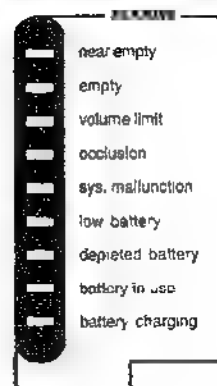
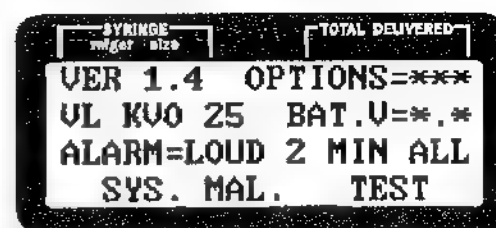
The audio alarm sounds.

Line 4: The LCD states "SYSTEM TEST" then it states "LED/ALARM TEST" and all LEDs (Light Emitting Diode) except the BATTERY CHARGING and SYSTEM MALFUNCTION briefly light.

**NOTE:** *The Battery In Use, STOP/PROGRAM, and DELIVER LEDs blink.*



The pump performs a System Malfunction Test by lighting the System Malfunction LED and sounding the audio alarm. Line 1 through 3 continue to display the information described above.



# OPERATING INSTRUCTIONS continued...

## STEP 3: PROGRAMMING THE MODEL 2001 - INTRODUCTION

The program key "LED" (Light Emitting Diode) blinks, and a slow intermittent beep (#1) sounds to indicate the Program Mode. (The alarm temporarily silences by pressing the ALARM OFF/ON Key once.) Program or function changes occur only in the Stop/Program Mode.

A single audio peck indicates a valid key press. (Occurs even when the audio is turned off.)

### STEP 3A: ACCESSING THE DESIRED INFUSION MODE (only if more than one mode was custom programmed).

The Medfusion 2001 Syringe Pump employs sequential programming. The operator knows what selections can be made or programmed because they flash.

**NOTE:** The infusion modes appear in the following order, provided they were all custom programmed: CONTINUOUS, VOLUME/TIME, INTERMITTENT AUTO and INTERMITTENT MANUAL. These parameters do not appear if not custom programmed.

"PRESET MODE IS" on the third line of the LCD indicates only one mode was custom programmed. Refer to Section V, User Modes.

### STEP 3B: CONTINUOUS MODE

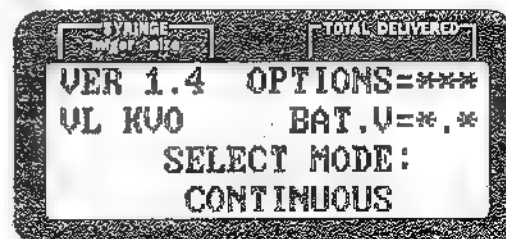
CONTINUOUS stands for Continuous Infusion.

**NOTE:** VL (Volume Limit) and KVO (KEEP VEIN OPEN) appear on the LCD only if they were custom programmed. No maximum rate was custom programmed (the space is blank.)

Press ENTER to use this mode. The pump automatically advances to CONTINUOUS program. See Section V, User Modes.

OR

Press SELECT to access other infusion modes. The next programmed choice appears sequentially (e.g., VOLUME/TIME, INTERMITTENT AUTO, INTERMITTENT MANUAL).



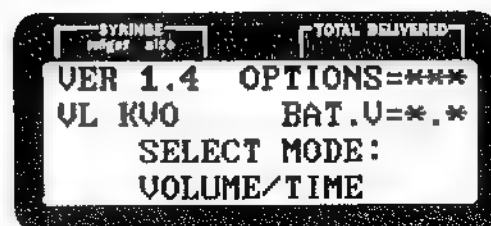
## OPERATING INSTRUCTIONS continued...

### STEP 3C: VOLUME/TIME

Press ENTER to use this mode. The pump automatically advances to the VOLUME OVER TIME program. See Section V, User Modes.

OR

Press SELECT to access other infusion modes. The next programmed choice appears sequentially (e.g., INTERMITTENT AUTO, INTERMITTENT MANUAL, CONTINUOUS.)

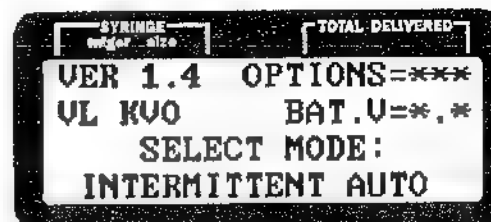


### STEP 3D: INTERMITTENT AUTO

Press ENTER to use this mode. The pump automatically advances to the INTERMITTENT AUTO program, See Section V, User Modes.

OR

Press SELECT to access other infusion modes. The next programmed choice appears sequentially (e.g., INTERMITTENT MANUAL, CONTINUOUS, VOLUME/TIME).



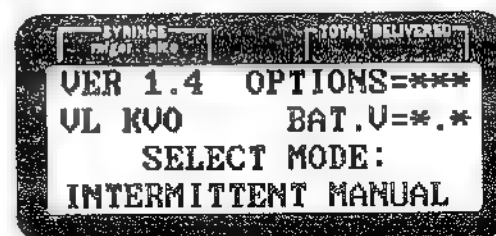
## OPERATING INSTRUCTIONS continued...

### STEP 3E: INTERMITTENT MANUAL

Press ENTER to use this mode. The pump automatically advances to the INTERMITTENT MANUAL program. See Section V, User Modes.

OR

If another infusion mode is desired, press SELECT and the next programmed choice will appear (e.g., CONTINUOUS, VOLUME/TIME, INTERMITTENT AUTO).



# SECTION V

## USER MODES

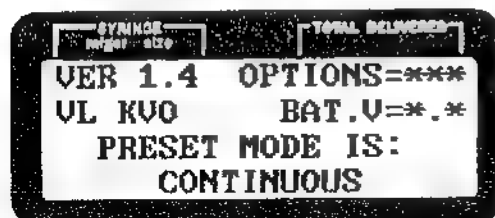
### Introduction

Go to the appropriate section for the mode you wish to program.

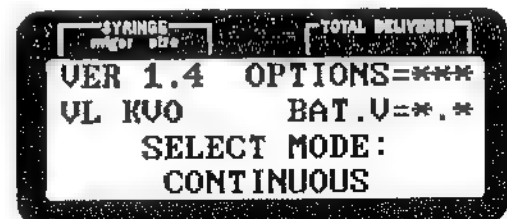
Continuous Infusion	Pages 15-24
Volume/Time	Pages 25-32
Intermittent Automatic	Pages 33-42
Intermittent Manual	Pages 43-52

#### STEP 1: CONTINUOUS INFUSION

When the pump is turned ON, lines 3 and 4 of the LCD display appear as follows:



OR



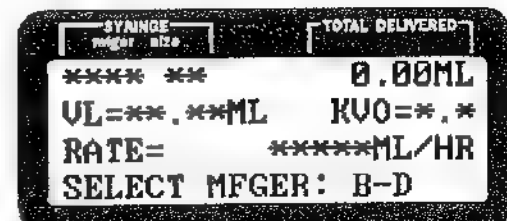
If "PRESET MODE IS" appears, no other modes were custom programmed.

If "SELECT MODE" appears, other infusion modes can be selected by using the SELECT key (see Section IV, Step 3). To select CONTINUOUS, press ENTER.

#### STEP 2: PROGRAMMING SYRINGE MANUFACTURER (CUSTOM PROGRAMMABLE)

**NOTE:** If a syringe manufacturer is custom programmed, the pump automatically advances to LOAD SYRINGE. Entry into the custom program mode allows a syringe manufacturer change.

Press SELECT key to make the choices appear on the LCD. Repeated presses of the SELECT key display the available choices. For example, B-D refers to Becton-Dickinson, MONO refers to Monoject, TERU refers to Terumo, etc.



Press ENTER to program your selection.

**NOTE:** The **SYRINGE SIZE MANUFACTURER** appears on the LCD and the pump automatically advances to the next programmable item.

**NOTE:** Turn the main power off and start over to correct a mis-entry of the Syringe Manufacturer. A correction is possible only when **SELECT MANUFACTURER** appears on the LCD.



**WARNING:** Verify that the syringe manufacturer on the LCD is the same as the syringe in use. Failure to use the listed manufacturer could result in inaccurate delivery. The pump cannot automatically identify syringe manufacturer.

## STEP 3: PROGRAMMING SYRINGE SIZE

The fourth line of the LCD flashes "LOAD SYRINGE — PRESS enter."

If the syringe is not already loaded onto the pump, load the syringe as instructed (see Section IV, Operating Instructions).

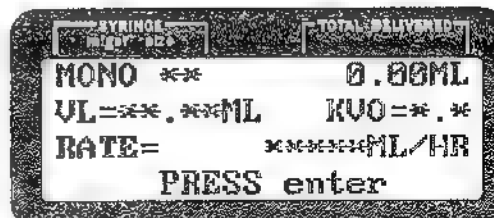
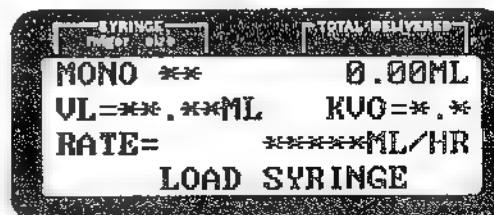
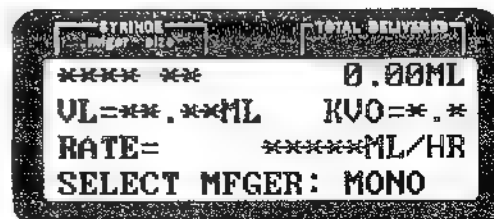
Once the syringe is properly loaded, press the ENTER key. The pump will automatically enter the correct syringe size and advance to the next programmable item, unless use of the B-D luer lock syringe was selected in custom programming in which case the operator must select syringe size (i.e., 1cc or 3cc). (See Appendix IV).



**WARNING:** Always confirm that the syringe size stated on the LCD agrees with the size of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.



**WARNING:** If the B-D luer lock option was selected in custom programming, the operator must select the appropriate syringe size (i.e., 1cc or 3cc). The pump cannot distinguish between these syringe sizes.



## USER MODES continued...

## Continuous Infusion

### STEP 4A: PROGRAMMING THE VOLUME LIMIT (CUSTOM PROGRAMMABLE)

If VOL LIMIT does not appear on the LCD, it was not custom programmed; skip to Step 6.

The VOLUME LIMIT (VL) feature allows delivery of a specific preprogrammed fluid volume from any size syringe. Therefore, the volume in the syringe can be greater than the volume to be infused. The pump stops automatically when the VL amount is reached.

**NOTE:** The VL may be programmed in hundredths for all syringe sizes. The minimum volume is 0.05 ml.

Program the VL with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.

Press ENTER to program the desired VL. The LCD automatically advances.

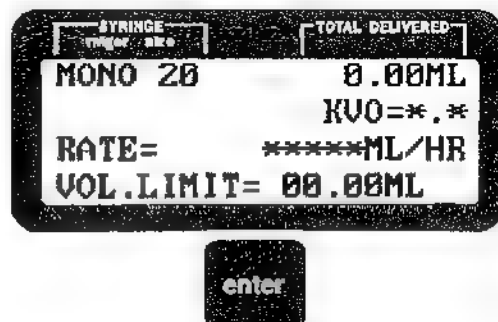
**NOTE:** If the VL exceeds the syringe capacity, the LCD will display **INVALID NUMBER !** and show the highest possible VL programmable for the syringe selected.



### STEP 4B: PROGRAMMING NO VOLUME LIMIT

A VL set at 00.00 eliminates VL as a previously programmed feature for this infusion. Press ENTER.

The VL disappears from the LCD for this infusion and the LCD automatically advances.



## USER MODES continued...

## Continuous Infusion

### STEP 5A: PROGRAMMING KVO (KEEP VEIN OPEN) RATE (CUSTOM PROGRAMMABLE)

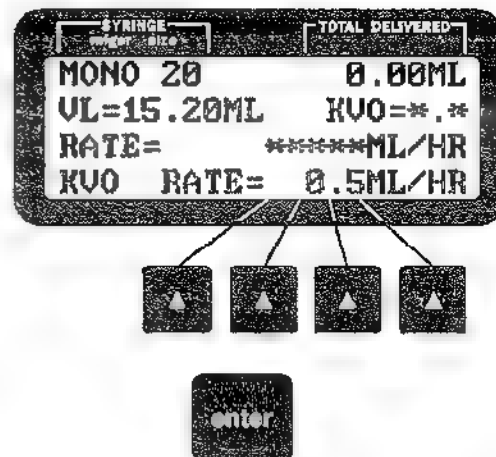
The KVO feature allows delivery of a KVO rate after a specified VOLUME LIMIT is administered.

**NOTE:** If a VL is not programmed, a KVO cannot be programmed. The LCD advances the screen for programming RATE, step 6.

**NOTE:** The program parameters for the KVO rate are 0.1 to 9.9 ml/hr., however, the KVO rate cannot exceed the primary delivery rate.

Program the KVO with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.

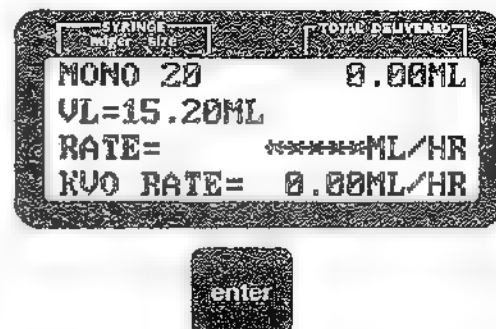
Press ENTER to program desired KVO. The LCD automatically advances.



### STEP 5B: PROGRAMMING NO KVO RATE

A KVO set at 0.0 eliminates KVO as previously programmed feature for this infusion. Press ENTER.

The KVO does not appear on the LCD for this infusion and the LCD automatically advances.



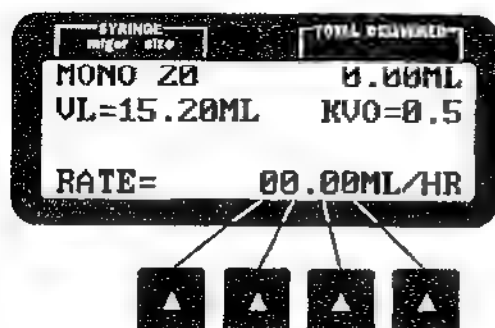


## USER MODES continued...

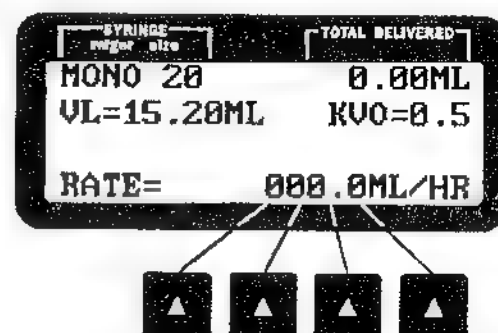
## Continuous Infusion

### STEP 6: PROGRAMMING RATE

**NOTE:** If a MAXIMUM RATE is custom programmed, the decimal point for all syringe sizes will be in 0.01 (hundredths) of a ml per hour as shown below. (See Appendix I)



**NOTE:** If a MAXIMUM RATE is not custom programmed, the decimal point for all syringe sizes greater than 6 ml will be in tenths (e.g. 0.1) as shown below and for syringes 6 ml and smaller in hundredths (0.01) of an ml per hour.



To program a rate, press the RATE SELECTION key(s) located beneath the rate. (The SELECT key does not program a rate.) NOTE: Continuously pressing the RATE SELECTION key(s) automatically advances the number.

Press ENTER to enter the desired rate.



No information on the LCD flashes. When the display is solid (not flashing), the operator can PRIME and/or commence DELIVERY.

NOTE: INVALID NUMBER ! displays on the LCD when an invalid rate entry occurs followed by the highest possible rate programmable for the syringe selected (see Appendix I).



### **CAUTION:**

The rate does not reset to 0 when the syringe size is changed.

## USER MODES continued...

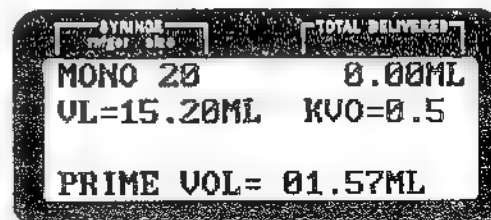
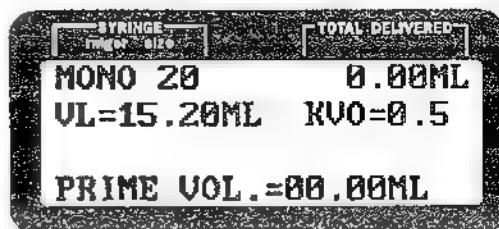
## Continuous Infusion

### STEP 7: PRIMING

Press and hold the PRIME key to purge air from the administration set. The LCD states "PRIME VOL = 00.00 ML" and the pump runs at its fastest rate. After approximately 16 seconds elapse, a continuous tone (#3) sounds. However, the pump continues to prime when the key is held down.

**NOTE:** The amount delivered while priming is NOT counted by the TOTAL VOLUME DELIVERED counter. However, the amount delivered is shown on the prime volume counter.

**NOTE:** The PRIME function only activates when the pump is in the STOP/PROGRAM MODE and all other functions are entered (e.g., Syringe Manufacturer, Syringe Size, Volume Limit, KVO and Rate).



**CAUTION:** The prime function should be utilized when placing a newly filled syringe on the pump or when attaching an infusion set. Priming will displace the air in the set with the infusate and removes mechanical slack before starting delivery. This assures that the syringe driver and plunger are in contact.



**WARNING:** Do not operate the pump in the prime function while connected to the patient. This could cause over-delivery of infusate or an infusion of air purged from the set.

**NOTE:** When priming, the occlusion alarm may occur if a small bore \*Mini-vol™ extension set is used. Intermittently press and release the PRIME key (versus pressing and holding it continuously) to alleviate this problem.

\* Mini-vol is a trademark of Medex, Inc.

## USER MODES continued...

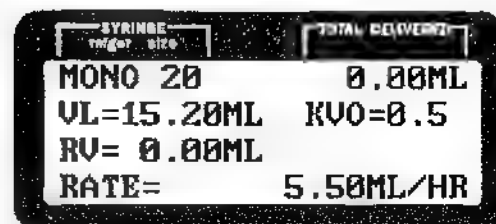
## Continuous Infusion

### STEP 8A: DELIVERY

Press the DELIVER key to begin the infusion. The LCD will not flash and the green LED DELIVER light begins to blink.

The RV appears on the LCD when delivery begins.

In the DELIVERY MODE, all keys are inactive except the ALARM ON/OFF key and the STOP/PROGRAM key.



### STEP 8A: DELIVERY

The RUNNING VOLUME (RV) in hundredths of a ml is displayed on the LCD.

**NOTE:** The RV records volume delivered since the last VL reset. By comparing the RV to the VL, one can determine how much more fluid must be delivered before reaching the VL. The RV is reset to zero when any of the following occur - Change in syringe size, Empty alarm, Reprogramming the VL, when the VL is reached and when prime is used.

**NOTE:** The RV is not reset to 0 when the total volume delivered is reset, however.



## STEP 9A: STOP DELIVERY

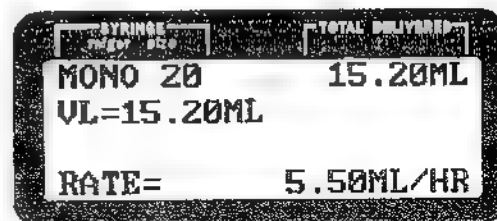
Press the STOP/PROGRAM key to stop the infusion. The STOP/PROGRAM LED blinks and a slow intermittent #1 audio alarm sounds.



**NOTE:** Alarms (e.g., occlusion, depleted battery, syringe pops out) interrupt delivery. Correct the alarm and press the DELIVER key to resume.

## STEP 9B: END OF DELIVERY - VOLUME LIMIT WITHOUT KVO

When the programmed VL is reached, the number 2 audio alarm sounds, the VL LED lights, the RV=VL and the STOP/PROGRAM LED blinks, indicating delivery cessation.



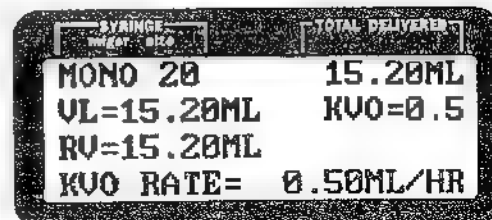
**NOTE:** The VL equals the TOTAL VOLUME DELIVERED readout only during the administration of the first infusion. To continue the infusion, press DELIVER. The VOLUME LIMIT ALARMS reset to zero and resume when the programmed amount is again delivered. For example, if two VL amounts are delivered, the TOTAL VOLUME DELIVERED amount equals twice the VL amount.



## STEP 9C: END OF DELIVERY - VOLUME LIMIT WITH KVO

When the programmed VL is reached (VL=RV), the pump automatically switches to the KVO rate, the VOLUME LIMIT LED lights and a type 1 audio alarm sounds.

The pump continues delivery until the STOP/PROGRAM key is pressed or until the EMPTY alarm sounds.



## STEP 10A: PROGRAMMING STANDBY TIME



**WARNING:** If the "some" alarm selection was made in the custom program mode the STOP/PROGRAM audio alarm was disabled, therefore an audio alarm will not occur when the STANDBY TIME elapses in the STANDBY MODE.

The STANDBY MODE allows temporary suspension of an infusion while retaining all pertinent data (e.g., rate, total volume delivered, syringe size, syringe manufacturer, etc.). The STANDBY TIMER delays the occurrence of the STOP/PROGRAM audio alarm by the time programmed.

Press the STOP/PROGRAM Key to stop the infusion.



Press the FUNCTION Key.



The LCD displays "STBY TIME=00:00" as shown.

Program the desired STANDBY TIME in hours and minutes (e.g., 03:30 for three hours and thirty minutes) with the RATE Keys.



Press ENTER to start the timer. The LCD states "STBY/ NEXT DEL = 03:30". The time remaining until the next delivery continues to display until the programmed STANDBY TIME elapses. VL and KVO only appear if previously programmed. TOTAL VOLUME DELIVERED reflects the volume delivered before delivery suspension and entry of the STANDBY TIME.



**NOTE:** When the STANDBY TIME elapses, "STBY/ NEXT DEL = 00:00" disappears from the screen, the STOP/PROGRAM audio alarm sounds and the previously programmed rate reappears.

Press the DELIVER key to begin delivery.



### **STEP 10B: CANCELLING THE STANDBY TIME**

Press the STOP/PROGRAM key to return the pump to the previously programmed setting.



Press the DELIVER key to begin delivery.

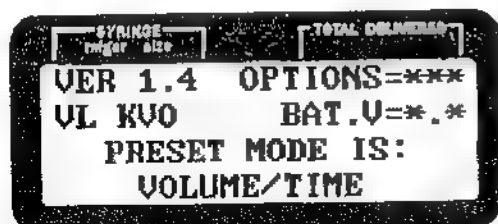


## STEP 1: VOLUME/TIME

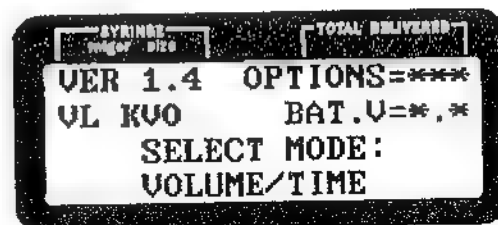
### Introduction

The VOLUME OVER TIME mode requires entry of at least two infusion parameters — the desired DOSE VOLUME (DV) and the desired DELIVERY TIME (DT). This mode is most useful in delivery of a single dose. The rate in ml per hour calculates automatically. The DOSE VOLUME becomes the VOLUME LIMIT (VL); therefore, a VL cannot be programmed. A KVO rate can be custom programmed, however, it cannot exceed the dose rate. Use this mode to deliver a single dose over time versus using the CONTINUOUS MODE where the rate must be calculated.

The following examples assume all available custom programmable items (parameters) are utilized (e.g., VL, KVO). When the pump is turned ON, lines 3 and 4 of the LCD display as follows:



If "PRESET MODE IS" appears, no other infusion modes were custom programmed.



If "SELECT MODE" appears, other infusion modes can be selected by using the SELECT key. To select VOLUME/TIME, press ENTER. (See Section IV, Step 3).

## STEP 2: PROGRAMMING SYRINGE MANUFACTURER

**NOTE:** If a SYRINGE MANUFACTURER is custom programmed, the pump automatically advances to LOAD SYRINGE. Entry into the custom program mode allows a syringe manufacturer change.

Press SELECT key to make the choices appear on the LCD. Repeated presses of the SELECT key display the available choices. For example, B-D refers to Becton-Dickinson, Mono refers to Monoject, Teru refers to Terumo, etc.



## USER MODES continued...

## Volume/Time

Press ENTER to program your selection.

**NOTE:** The *SYRINGE MANUFACTURER* appears on the LCD and the pump automatically advances to the next programmable item.

**NOTE:** Turn the main power off and start over to correct a mis-entry of the Syringe Manufacturer. A correction is possible only when *SELECT MANUFACTURER* appears on the LCD.



**WARNING:** Verify that the syringe manufacturer on the LCD is the same as the syringe in use. Failure to use the listed manufacturer could result in inaccurate delivery. The pump cannot automatically identify syringe manufacturer.

### STEP 3: PROGRAMMING SYRINGE SIZE

The fourth line of the LCD will flash "LOAD SYRINGE" — "PRESS enter."

If the syringe is not already loaded onto the pump, load the syringe as instructed (See Section IV, Operating Instructions).

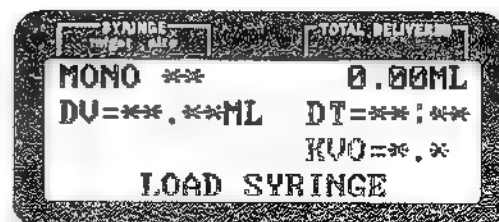
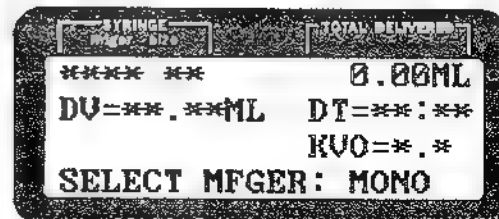
Once the syringe is properly loaded, press the ENTER key. The pump will automatically enter the correct syringe size and advance to the next programmable item, unless use of the B-D luer lock syringe was selected in custom programming in which case the operator must select syringe size (i.e., 1cc or 3cc). (See Appendix IV).



**WARNING:** Always confirm that the syringe size stated on the LCD agrees with the size of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.



**WARNING:** If the B-D luer lock option was selected in custom programming, the operator must select the appropriate syringe size (i.e., 1cc or 3cc). The pump cannot distinguish between these syringe sizes.





## STEP 4: PROGRAMMING THE VOLUME LIMIT (CUSTOM PROGRAMMABLE)

With this infusion mode (V/T), the VOLUME LIMIT (VL) is automatically programmed but the VL does not appear on the LCD.

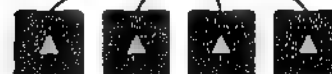
## STEP 5: PROGRAMMING KVO (KEEP VEIN OPEN) RATE (CUSTOM PROGRAMMABLE)

The KVO feature allows delivery of a KVO rate after the specified delivery is administered.

**NOTE:** The program parameters for the KVO rate are 0.1 and 9.9 ml/hr, however, the KVO rate cannot exceed the primary delivery rate.

Program the KVO with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.

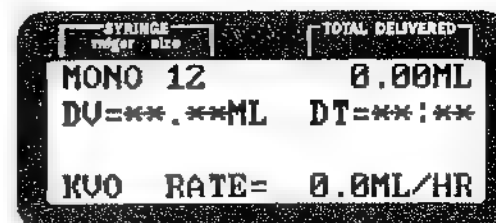
Press ENTER to program desired KVO. The LCD automatically advances.



## STEP 5B: PROGRAMMING NO KVO RATE

A KVO set at 0.0 eliminates KVO as a previously programmed feature for this infusion. Press ENTER.

The KVO disappears from the LCD for this infusion and the LCD automatically advances.



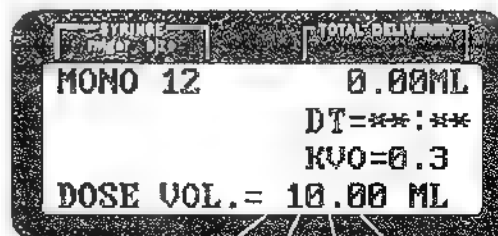
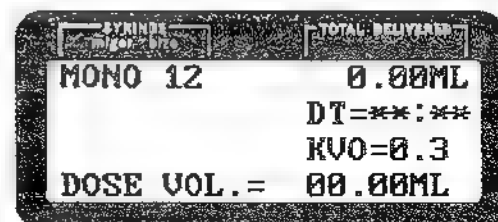
## STEP 6: PROGRAMMING DOSE VOLUME (DV)

**NOTE:** The minimum DOSE VOLUME (DV) is 0.05 ml.

Press the appropriate RATE SELECTION key(s) to program a DOSE VOLUME (DV).

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

Press ENTER key to enter the desired DV. The LCD automatically advances.



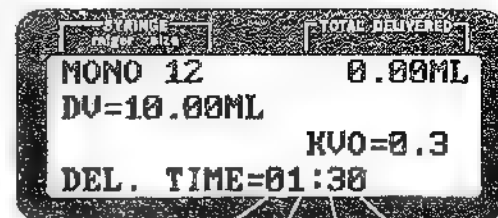
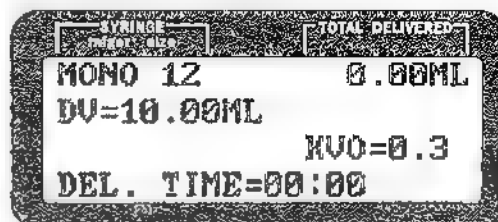
## STEP 7: PROGRAMMING DELIVERY TIME (DT)

Press the appropriate RATE SELECTION key(s) to program a DELIVERY TIME (DT) in hours and minutes.

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

**NOTE:** Time entries in minutes equal to or exceeding 60 [i.e., 00:60 to 00:99] are converted to hours [i.e., 01:00 to 01:39]. The time entry, then, must be confirmed by pressing the ENTER key.

Press ENTER key to enter the desired DT. The LCD automatically advances.



**NOTE:** *INVALID NUMBER* displays on the LCD when and invalid rate entry occurs. The fastest possible infusion time will appear for the DV selection.

The pump automatically calculates the rate and all information on the LCD is solid (not flashing). Options are to PRIME and/or begin DELIVERY.

## STEP 8: PRIMING

Push and hold the PRIME key to purge air from the administration set. The LCD states "PRIME VOL = 00.00ml" and the pump runs at its fastest rate. After approximately 16 seconds elapse, a continuous tone (#3) sounds. However, the pump continues to prime when the key is held down.

**NOTE:** *The amount delivered while priming is NOT counted by the TOTAL VOLUME DELIVERED counter. However, the amount delivered is shown on the prime volume counter.*

**NOTE:** *The PRIME function only activates when the pump is in the STOP/PROGRAM MODE and all other functions are entered (e.g., Syringe Manufacturer, Syringe Size, Volume Limit, KVO and Rate).*



**CAUTION:** The prime function should be utilized when placing a newly filled syringe on the pump or when attaching an infusion set. Priming will displace the air in the set with the infusate and removes mechanical slack before starting delivery. This assures that the syringe driver and plunger are in contact.



**WARNING:** Do not operate the pump in the prime function while connected to the patient. This could cause over-delivery of infusate or an infusion of air purged from the set.

**NOTE:** *When priming, the occlusion alarm may occur if a small bore Mini-vol™ extension set is used. Intermittently press and release the PRIME key (versus pressing and holding it continuously) to alleviate this problem.*

SYRINGE manuf size	TOTAL DELIVERED
MONO 12	0.00ML
DV=10.00ML	DT=01:30
	KVO=0.3
RATE=	6.667ML/HR

SYRINGE manuf size	TOTAL DELIVERED
MONO 12	0.00ML
DV=10.00ML	DT=01:30
	KVO=0.3
PRIME VOL=	00.00ML

SYRINGE manuf size	TOTAL DELIVERED
MONO 12	0.00ML
DV=10.00ML	DT=01:30
	KVO=0.3
PRIME VOL=	01.57ML

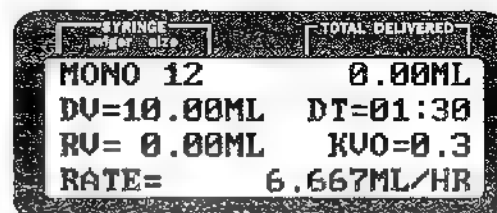


## STEP 9A: DELIVERY

Press the DELIVER key to begin the infusion. The LCD will not flash and the green LED DELIVER light begins to blink.

The RV appears on the LCD when delivery begins

In the DELIVERY MODE, all keys are inactive except the ALARM ON/OFF key and the STOP/PROGRAM key.



## STEP 9B: RUNNING VOLUME

The RUNNING VOLUME (RV) in hundredths of a ml will be displayed on the LCD.

**NOTE:** The RV records how much of the DOSE VOLUME (e.g., VOLUME LIMIT) has been delivered.

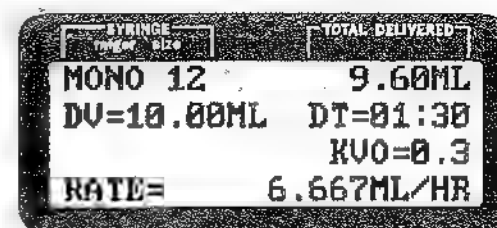
The RV is reset to zero when any of the following events occur: change in syringe size, occurrence of the empty alarm, reprogramming of the DV and DT, when the DV is reached and when the Prime is utilized.

The RV is not reset when the total volume delivered is reset to 0, however.



## STEP 10A: STOP DELIVERY

Press the STOP/PROGRAM key to stop the infusion. The STOP/PROGRAM LED blinks and a slow intermittent #1 audio alarm sounds.



## USER MODES continued...

## Volume/Time

**NOTE:** Alarms (e.g., occlusion, depleted batteries, syringe pops out) interrupt delivery. Correct the alarm and press **DELIVER** key to resume. The remaining DV is given at the proper rate.

### STEP 10B: END OF DELIVERY WITHOUT KVO

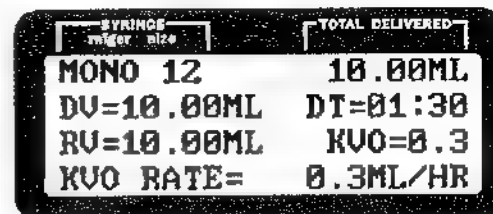
When the DOSE VOLUME (DV) is reached, the number 2 audio alarm sounds, the VL LED lights, the RV=DV, and the STOP/PROGRAM LED blinks indicating delivery cessation.



**NOTE:** The DV only equals the TOTAL VOLUME DELIVERED readout during the administration of the first infusion. To continue the infusion, press **DELIVER**. The VOLUME LIMIT ALARMS reset to zero (RV=0.00 ml) and come back on when the programmed amount is delivered. For example, if two DV amounts are delivered, the TOTAL VOLUME DELIVERED amount will equal twice the DV amount.

### STEP 10C: END OF DELIVERY WITH KVO

When the programmed DV is reached, the pump automatically switches to the KVO rate, the VOLUME LIMIT LED lights (RV=DV) and a type 1 audio alarm sounds.



The pump continues delivery until the STOP/PROGRAM key is pressed or until the EMPTY alarm sounds.

## STEP 11A: PROGRAMMING STANDBY TIME



**WARNING:** If the "some" alarm selection was made in the custom program mode, the STOP/PROGRAM audio alarm was disabled, therefore an audio alarm will not occur when the STANDBY TIME elapses in the STANDBY MODE.

The STANDBY MODE allows temporary suspension of an infusion while retaining all pertinent data (e.g., rate, total volume delivered, syringe size, syringe manufacturer, etc.). The STANDBY TIMER delays the occurrence of the STOP/PROGRAM audio alarm by the time programmed.

Press the STOP/PROGRAM Key to stop the infusion.

Press the FUNCTION Key.

The LCD displays "STBY TIME = 00:00" as shown.

Program the desired STANDBY TIME in hours and minutes (e.g. 03:30 for three hours and thirty minutes) with the RATE Keys.

Press ENTER to start the timer. The LCD states "STBY/NEXT DEL = 03:30". The times remaining until the next delivery continues to display until the programmed STANDBY TIME elapses.

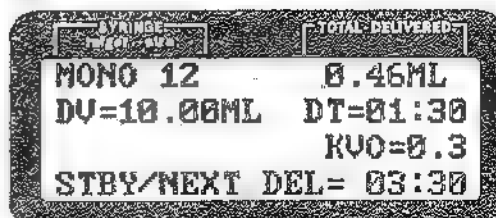
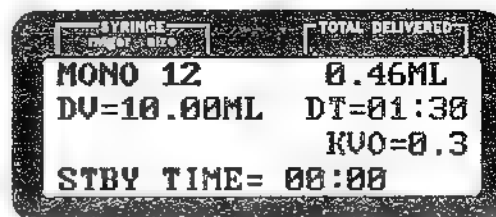
**NOTE:** When the STANDBY TIME ELAPSES, "STBY/NEXT DEL = 00:00" disappears from the screen, the STOP/PROGRAM audio alarm sounds and the previously programmed rate reappears.

Press the DELIVER Key to begin delivery.

## STEP 11B: CANCELLING THE STANDBY TIME

Press the STOP/PROGRAM key to return the pump to the previously programmed setting.

Press the DELIVER key to begin delivery.

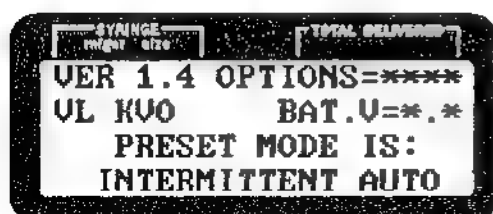


## STEP 1: INTERMITTENT AUTOMATIC

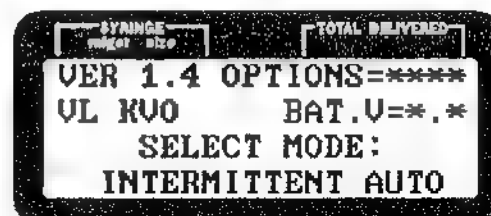
### Introduction

The INTERMITTENT AUTO mode requires entry of at least three parameters — DOSE VOLUME (DV), DELIVERY TIME (DT), and the TIME BETWEEN DOSES (TB). The rate in ml per hour calculates automatically. VOLUME LIMIT (VL) and KVO can be custom programmed. In this infusion mode, the pump automatically administers the DV over the DT at intervals established by the TB. The TB includes the DT. (Use this mode for automatic delivery of multiple doses.)

When the pump is turned ON, lines 3 and 4 of the LCD display appear as follows:



If "PRESET MODE IS" appears, no other infusion modes were custom programmed.



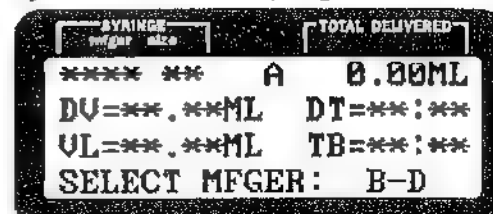
If "SELECT MODE" appears, other infusion modes can be selected by using the SELECT key. To select INTERMITTENT AUTOMATIC, press ENTER. (See Section IV, Step 3).

## STEP 2: PROGRAMMING SYRINGE MANUFACTURER

**NOTE:** The "A" in the first line identifies the automatic mode.

**NOTE:** If a SYRINGE MANUFACTURER is custom programmed, the pump automatically advances to LOAD SYRINGE. Entry into the custom program mode allows a syringe manufacturer change.

Press SELECT key to make the choices appear on the LCD. Repeated presses of the SELECT key display the available choices. For example, B-D refers to Becton-Dickinson, Mono refers to Monoject, Teru refers to Terumo, etc.



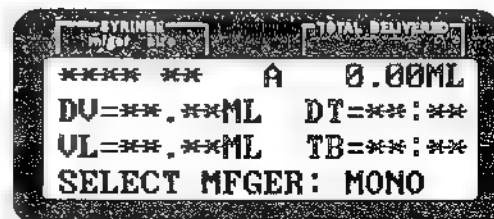
## USER MODES continued...

## Intermittent Automatic

Press ENTER to program your selection.

**NOTE:** The *SYRINGE MANUFACTURER* appears on the LCD and the pump automatically advances to the next programmable item.

**NOTE:** Turn the main power off and start over to correct a mis-entry of the Syringe Manufacturer. A correction is possible only when *SELECT MANUFACTURER* appears on the LCD.



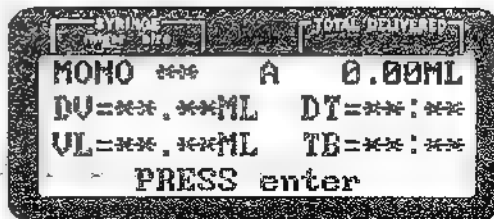
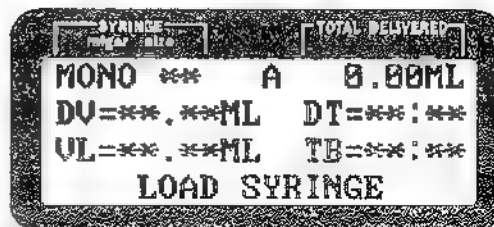
**WARNING:** Verify that the syringe manufacturer on the LCD is the same as the syringe in use. Failure to use the listed manufacturer could result in inaccurate delivery. The pump cannot automatically identify syringe manufacturer.

### STEP 3: PROGRAMMING SYRINGE SIZE

The fourth line of the LCD will flash "LOAD SYRINGE" — "PRESS enter."

If the syringe is not already loaded onto the pump, load the syringe as instructed (See Section IV, Operating Instructions).

Once the syringe is properly loaded, press the ENTER key. The pump will automatically enter the correct syringe size and advance to the next programmable item, unless use of the B-D luer lock syringe was selected in custom programming in which case the operator must select syringe size (i.e., 1cc or 3cc). (See Appendix IV).



**WARNING:** Always confirm that the syringe size stated on the LCD agrees with the size of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.



**WARNING:** If the B-D luer lock option was selected in custom programming, the operator must select the appropriate syringe size (i.e., 1cc or 3cc). The pump cannot distinguish between these syringe sizes.



### Intermittent Automatic

## USER MODES continued...

## Intermittent Automatic

### STEP 5A: PROGRAMMING KVO (KEEP VEIN OPEN) RATE (CUSTOM PROGRAMMABLE)

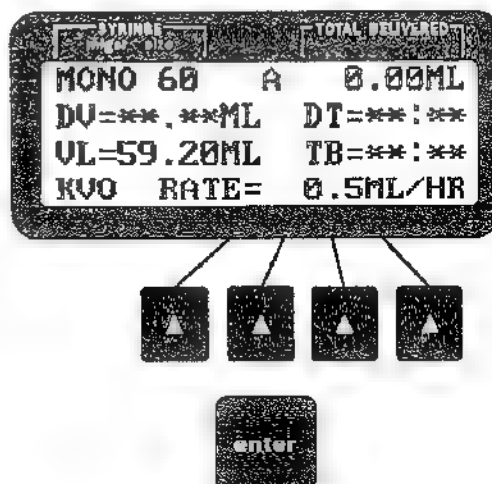
If KVO does not appear on the LCD during step 1, it was not custom programmed; skip to step 6.

The KVO feature allows delivery of a KVO (keep vein open) rate after the specified delivery is administered. The program parameters for the KVO rate are 0.1 and 9.9 ml/hr, however, the KVO rate cannot exceed the primary delivery rate.

Program the KVO with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.

Press ENTER to program desired KVO. The LCD automatically advances.

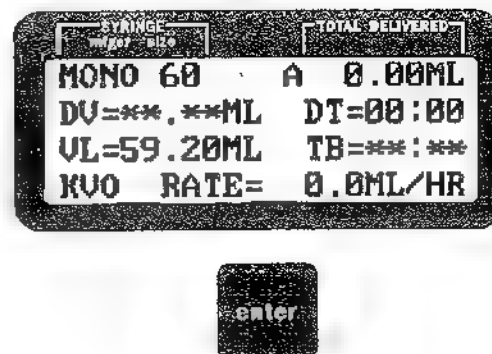
**NOTE:** The actual KVO rate does not display on the LCD. When a KVO rate is programmed, an asterisk follows the VL line.



### STEP 5B: PROGRAMMING NO KVO RATE

A KVO set at 0.0 eliminates KVO as a previously programmed feature for this infusion. Press ENTER.

The asterisk by the VL disappears from the LCD and the KVO is not active for this infusion.

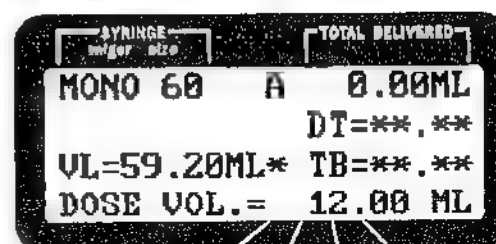
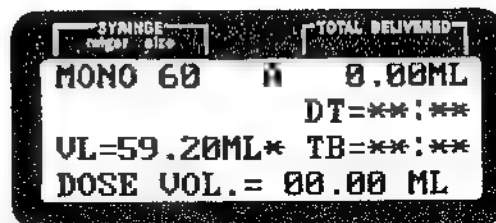


## STEP 6: PROGRAMMING DOSE VOLUME (DV)

Press the appropriate RATE SELECTION key(s) to program a DOSE VOLUME (DV).

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

Press ENTER key to enter the desired DV. The LCD automatically advances.



## STEP 7: PROGRAMMING DELIVERY TIME (DT)

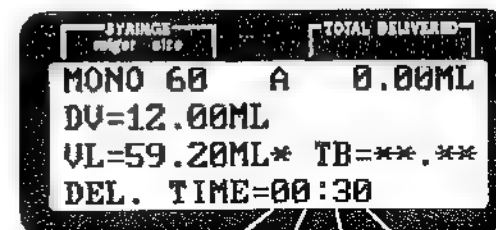
Press the appropriate RATE SELECTION key(s) to program a DELIVERY TIME (DT) in hours and minutes.

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

**NOTE:** Time entries in minutes equal to or exceeding 60 [i.e., 00:60 to 00:99] are converted to hours [i.e., 01:00 to 01:39]. The time entry, then, must be confirmed by pressing the ENTER key.

Press ENTER key to enter the desired DT. The LCD automatically advances.

**NOTE:** INVALID NUMBER displays on the LCD when an invalid rate entry occurs. The fastest possible infusion time will appear for the DV selected.



## USER MODES continued...

## Intermittent Automatic

### STEP 8: PROGRAMMING THE TIME BETWEEN DELIVERIES (TB)

To program the TIME BETWEEN (TB) deliveries in hours and minutes (e.g., HRS:MIN), press the appropriate RATE SELECTION key(s).

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

**NOTE:** Time entries in minutes equal to or exceeding 60 [i.e., 00:60 to 00:99] are converted to hours [i.e., 01:00 to 01:39]. The time entry, then, must be confirmed by pressing the ENTER key.

Press ENTER to enter the desired TB, The LCD automatically advances.

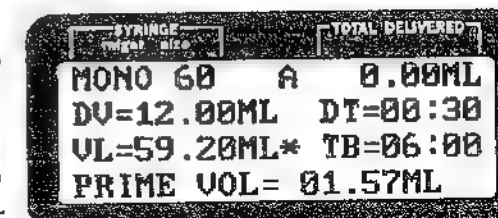
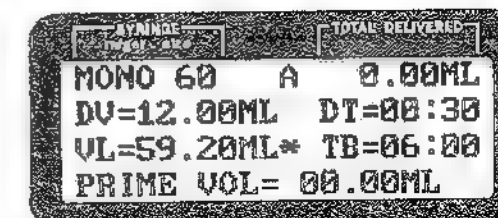
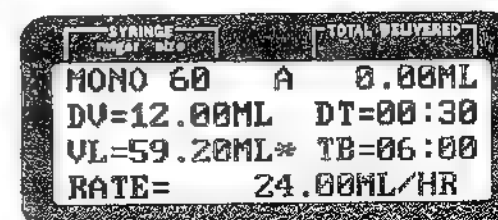
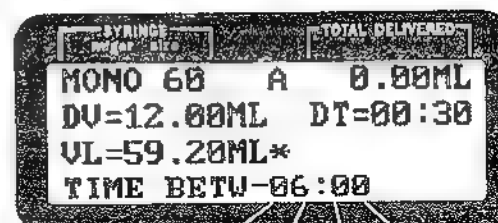
The pump automatically calculates the rate and the information on the LCD is solid (not flashing). The operator can PRIME and/or begin delivery.

### STEP 9: PRIMING

Push and hold the PRIME key to purge air from the administration set. The LCD states "PRIME VOL = 00.00ml" and the pump runs at its fastest rate. After approximately 16 seconds elapse, a continuous tone (#3) sounds. However, the pump continues to prime when the key is held down.

**NOTE:** The amount delivered while priming is NOT counted by the TOTAL VOLUME DELIVERED counter. However, the amount delivered is shown on the prime volume counter.

**NOTE:** The PRIME function only activates when the pump is in the STOP/PROGRAM MODE and all other functions are entered (e.g., Syringe Manufacturer, Syringe Size, Volume Limit, KVO and Rate).



## USER MODES continued...

## Intermittent Automatic



**CAUTION:** The prime function should be utilized when placing a newly filled syringe on the pump or when attaching an infusion set. Priming will displace the air in the set with the infusate and also to remove mechanical slack before starting delivery. This assures that the syringe driver and plunger are in contact.



**WARNING:** Do not operate the pump in the prime function while connected to the patient. This could cause over-delivery of infusate or an infusion of air purged from the set.

**NOTE:** When priming, the occlusion alarm may occur if a small bore Mini-vol™ extension set is used. Intermittently press and release the PRIME key (versus pressing and holding it continuously) to alleviate this problem.

### STEP 10A: DELIVERY

Press the DELIVER key to begin the infusion. The LCD will not flash and the green LED DELIVER light begins to blink.



In the DELIVERY MODE, all keys are inactive except the ALARM ON/OFF key and the STOP/PROGRAM key.

### STEP 10B: RUNNING VOLUME (ONLY IF VL IS PROGRAMMED)

Press and hold the DELIVER key during delivery to display the RUNNING VOLUME (RV).

**NOTE:** The RV records volume delivered since the last VL reset. By comparing the RV to the VL, one can determine how much more fluid must be delivered before reaching the VL.



The RV is reset to zero when any of the following events occur: change in syringe size, occurrence of the empty alarm, reprogramming of the DV, DT and TB, when the VL is reached and the Prime is utilized.

## USER MODES continued...

## Intermittent Automatic

### STEP 11A: STANDBY WITH KVO

After the pump delivers the DV over the DT, it enters the STANDBY mode. The STANDBY TIME displays the time remaining before the next infusion begins. If a KVO rate is programmed, it will be in effect during the STBY time.

The STANDBY TIME of 5HRS, 30MINS indicates that the infusion just ended. The DELIVER LED continues to blink.

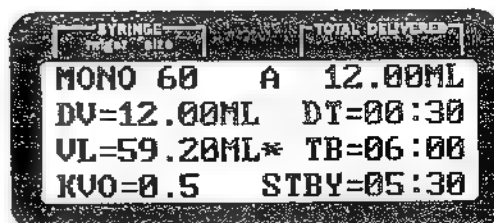
Press DELIVER to review RV if desired.

STANDBY TIMER continues to count down.

**NOTE:** When STBY equals 00:00, go to Step 11C



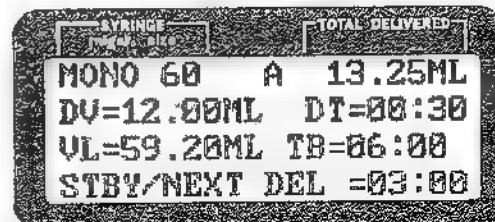
**WARNING:** If the "some" alarm selection was made in the custom program mode, the STOP/PROGRAM audio alarm was disabled, therefore an audio alarm will not occur when the STANDBY TIME elapses in the STANDBY MODE.



### STEP 11B: STANDBY WITHOUT KVO

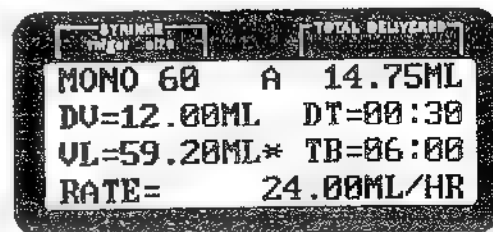
After the pump delivers the DV over the DT, it enters the STANDBY MODE. The STANDBY TIME displays the time remaining before the next infusion begins. When the STANDBY TIME is 00:00 go to Step 11C.

**NOTE:** Since a KVO rate is not programmed, both the STOP/PROGRAM and DELIVER LEDs are turned off (i.e., do not blink) during the STBY TIME.



### STEP 11C: AUTOMATIC DELIVERY BEGINS

When the STANDBY TIME equals 00:00 the DV is given over to the DT.



## USER MODES continued...

## Intermittent Automatic

### STEP 12A: STOP DELIVERY

Press the STOP/PROGRAM key to stop the infusion. The STOP/PROGRAM LED blinks and a slow intermittent #1 audio alarm sounds.

**NOTE:** Alarms (e.g., occlusion, depleted batteries, syringe pops out) interrupt delivery. Correct the alarm and press DELIVER key to resume. The remaining DV is given at the proper rate. If interruption of the delivery occurs during dose delivery, the running timer is suspended. The timer resumes when the delivery resumes. However, the running timer continues if the interruption occurs during the STANDBY TIME.



### STEP 12B: END OF DELIVERY - VOLUME LIMIT (VL) WITHOUT KVO

When the programmed VL is reached, the number 2 audio alarm sounds, the VL LED lights, the RV-VL, and the STOP/PROGRAM LED blinks indicating delivery cessation.

**NOTE:** The VL equals the TOTAL VOLUME DELIVERED readout only during the administration of the first infusion. To continue the infusion, press DELIVER. The VOLUME LIMIT ALARMS reset to zero (RV=0.0 ml) and resume when the programmed amount is again delivered. For example, if two VL amounts are delivered, the TOTAL VOLUME DELIVERED amount equals twice the VL amount.



### STEP 12C: END OF DELIVERY - VOLUME LIMIT WITH KVO

When the programmed VL is reached, the pump automatically switches to the KVO rate, the VOLUME LIMIT LED lights and a type 1 audio alarm sounds at the custom programmed alarm delay interval.

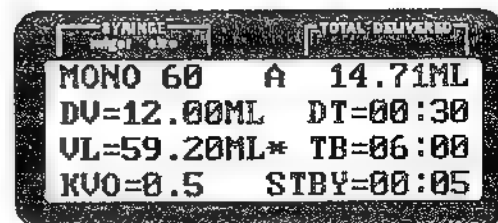
The pump continues delivery until the STOP/PROGRAM key is pressed or until the EMPTY alarm sounds.



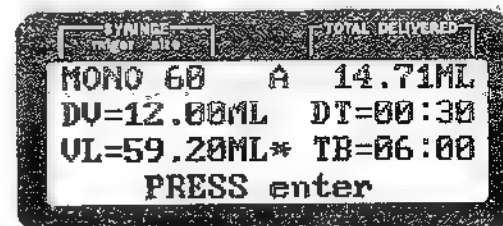
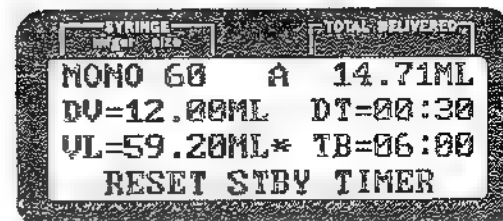
## STEP 13: RESET STANDBY TIMER

The STANDBY TIMER can be reset to zero so the next infusion begins immediately.

Press STOP/PROGRAM, then press the FUNCTION key.



The LCD alternates between "RESET STBY TIMER" and "PRESS ENTER". To reset the timer, press ENTER. Press DELIVER key to begin the next infusion.



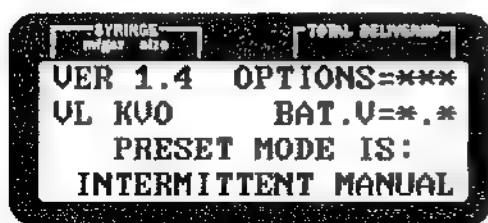


## STEP 1: INTERMITTENT MANUAL

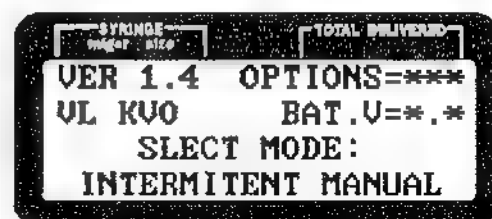
### Introduction

The INTERMITTENT MANUAL mode requires entry of at least three parameters — DOSE VOLUME (DV), DELIVERY TIME (DT), and the TIME BETWEEN DOSES (TB). The rate in milliliters per hour automatically calculates. Both VOLUME LIMIT (VL) and KVO can be custom programmed. In this infusion mode the pump does not automatically administer the DV over the DT at intervals established by the TB. The DT is included within the TB. Use this mode for manually initiated delivery of multiple doses.

When the pump is turned ON, lines 3 and 4 of the LCD display appear as follows:



If "PRESET MODE IS" appears, no other infusion modes were custom programmed.



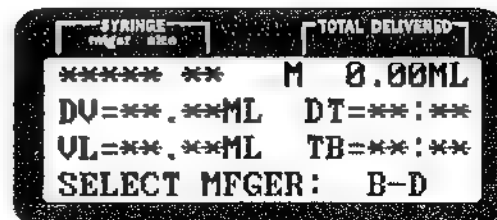
If "SELECT MODE" appears, other infusion modes can be selected by using the SELECT key. To select INTERMITTENT MANUAL, press ENTER. (See Section IV, Step 3).

## STEP 2: PROGRAMMING SYRINGE MANUFACTURER

**NOTE:** The "M" in the first line identifies the manual mode.

**NOTE:** If a SYRINGE MANUFACTURER is custom programmed, the pump automatically advances to LOAD SYRINGE. Entry into the custom program mode allows a syringe manufacturer change.

Press SELECT key to make the choices appear on the LCD. Repeated presses of the SELECT key display the available choices. For example, B-D refers to Becton-Dickinson, Mono refers to Monoject, Teru refers to Terumo, etc.



Press ENTER to program your selection.

**NOTE:** The *SYRINGE MANUFACTURER* appears on the LCD and the pump automatically advances to the next programmable item.

**NOTE:** Turn the main power off and start over to correct a mis-entry of the Syringe Manufacturer. A correction is possible only when *SELECT MANUFACTURER* appears on the LCD.



**WARNING:** Verify that the syringe manufacturer on the LCD is the same as the syringe in use. Failure to use the listed manufacturer could result in inaccurate delivery. The pump cannot automatically identify syringe manufacturer.

## STEP 3: PROGRAMMING SYRINGE SIZE

The fourth line of the LCD will flash "LOAD SYRINGE" — "PRESS enter."

If the syringe is not already loaded onto the pump, load the syringe as instructed (See Section IV, Operating Instructions).

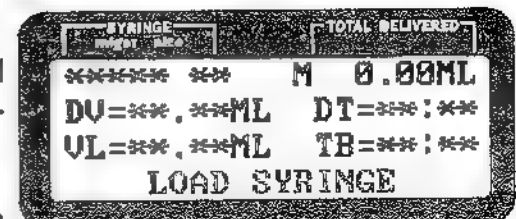
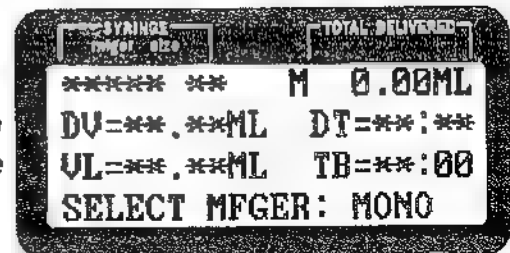
Once the syringe is properly loaded, press the ENTER key. The pump will automatically enter the correct syringe size and advance to the next programmable item, unless use of the B-D luer lock syringe was selected in custom programming in which case the operator must select syringe size (i.e., 1cc or 3cc). (See Appendix IV).



**WARNING:** Always confirm that the syringe size stated on the LCD agrees with the size of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.



**WARNING:** If the B-D luer lock option was selected in custom programming, the operator must select the appropriate syringe size (i.e., 1cc or 3cc). The pump cannot distinguish between these syringe sizes.



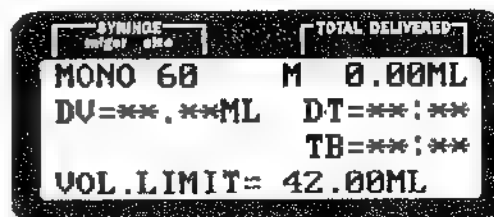
## STEP 4A: PROGRAMMING THE VOLUME LIMIT (CUSTOM PROGRAMMABLE)

If VOL. LIMIT does not appear on the LCD, it was not custom programmed; skip to step 6.

The VOLUME LIMIT (VL) feature allows delivery of a specific preprogrammed fluid volume from any size syringe. Therefore, the volume in the syringe can be greater than the volume to be infused. The pump stops automatically when the VL amount is reached. The VL may be programmed in hundredths for all syringe sizes.

Program the VL with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.

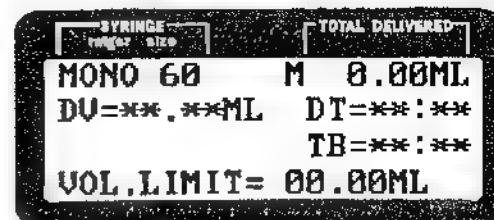
Press ENTER to program desired VL. The LCD automatically advances.



**NOTE:** If the VL exceeds the syringe capacity, the LCD will display *INVALID NUMBER* and show the highest possible VL programmable for the syringe selected.

## STEP 4B: PROGRAMMING NO VOLUME LIMIT

A VL set at 00.00 eliminates VL as a previously programmed feature for this infusion. Press ENTER.



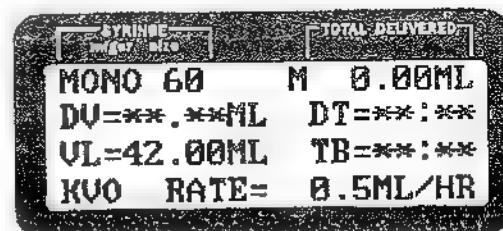
The VL disappears from the LCD for this infusion and the LCD automatically advances.

## STEP 5A: PROGRAMMING KVO (KEEP VEIN OPEN) RATE (CUSTOM PROGRAMMABLE)

If KVO does not appear on the LCD during Step 1, it was not custom programmed; skip to Step 6.

The KVO feature allows delivery of a KVO (keep vein open) rate after the specified delivery is administered. The program parameters for the KVO rate are 0.1 and 9.9 ml/hr, however, the KVO rate cannot exceed the primary delivery rate.

Program the KVO with the RATE SELECTION key(s). Continuously pressing the RATE SELECTION key(s) automatically advances the number.



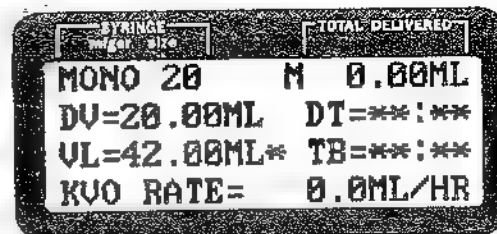
Press ENTER to program desired KVO. The LCD automatically advances.

**NOTE:** The actual KVO rate does not display on the LCD. When a KVO rate is programmed, an asterisk follows the VL line.

## STEP 5B: PROGRAMMING NO KVO RATE

A KVO set at 0.0 eliminates KVO as a previously programmed feature for this infusion. Press ENTER.

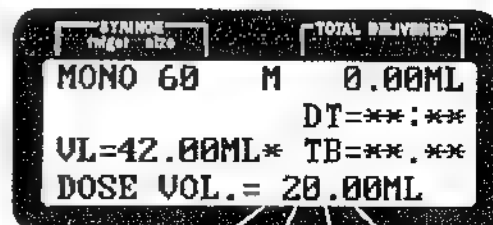
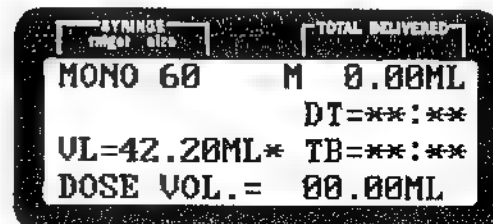
The asterisk by the VL disappears from the LCD and the KVO is not active for this infusion.



## STEP 6: PROGRAMMING DOSE VOLUME (DV)

Press the appropriate RATE SELECTION key(s) to program a DOSE VOLUME (DV).

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.



Press ENTER key to enter the desired DV. The LCD automatically advances.

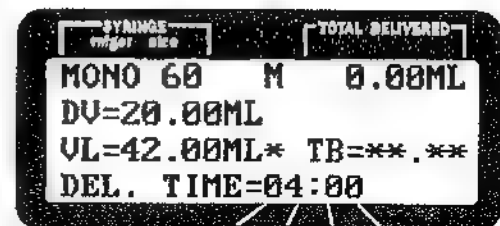


## STEP 7: PROGRAMMING DELIVERY TIME (DT)

Press the appropriate RATE SELECTION key(s) to program a DELIVERY TIME (DT) in hours and minutes.

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

**NOTE:** Time entries in minutes equal to or exceeding 60 [i.e., 00:60 to 00:99] are converted to hours [i.e., 01:00 to 01:39]. The time entry, then, must be confirmed by pressing the ENTER key.



Press ENTER key to enter the desired DT. The LCD automatically advances.



**NOTE:** INVALID NUMBER displays on the LCD when an invalid rate entry occurs. The fastest possible infusion time will appear for the DV selected.

## STEP 8: PROGRAMMING THE TIME BETWEEN DELIVERIES (TB)

To program the TIME BETWEEN (TB) deliveries in hours and minutes (e.g., HRS:MINS), press the appropriate RATE SELECTION key(s).

**NOTE:** Continuously pressing the RATE SELECTION key(s) automatically advances the number.

**NOTE:** Time entries in minutes equal to or exceeding 60 [i.e., 00:60 to 00:99] are converted to hours [i.e., 01:00 to 01:39]. The time entry, then, must be confirmed by pressing the ENTER key.

Press ENTER to enter the desired TB. The LCD automatically advances.

The pump automatically calculates the rate and the information on the LCD is solid (not flashing). The operator can PRIME and/or begin delivery.

## STEP 9: PRIMING

Push and hold the PRIME key to purge air from the administration set. The LCD states "PRIME VOL = 00.00ml" and the pump runs at its fastest rate. After approximately 16 seconds elapse, a continuous tone (#3) sounds. However, the pump continues to prime when the key is held down.

**NOTE:** The amount delivered while priming is NOT counted by the TOTAL VOLUME DELIVERED counter. However, the amount delivered is shown on the prime volume counter.

SYRINGE	TOTAL DELIVERED
model size	
MONO 60	M 0.00ML
DV=20.00ML	DT=04:00
VL=42.00ML*	
TIME BETW=00:00	

SYRINGE	TOTAL DELIVERED
model size	
MONO 60	M 0.00ML
DV=20.00ML	DT=04:00
VL=42.00ML*	
TIME BETW=06:00	



SYRINGE	TOTAL DELIVERED
model size	
MONO 60	M 0.00ML
DV=20.00ML	DT=04:00
VL=42.00ML*	TB=06:00
RATE=	5.000ML/HR

SYRINGE	TOTAL DELIVERED
model size	
MONO 60	M 0.00ML
DV=20.00ML	DT=04:00
VL=42.00ML*	TB=06:00
PRIME VOL= 00.00ML	

SYRINGE	TOTAL DELIVERED
model size	
MONO 60	M 0.00ML
DV=20.00ML	DT=04:00
VL=42.00ML*	TB=06:00
PRIME VOL= 01.57ML	



The PRIME function only activates when the pump is in the STOP/PROGRAM MODE and all other functions are entered (e.g., Syringe Manufacturer, Syringe Size, Volume Limit, KVO and Rate).



**CAUTION:** The prime function should be utilized when placing a newly filled syringe on the pump or when attaching an infusion set. Priming will displace the air in the set with the infusate and removes mechanical slack before starting delivery. This assures that the syringe driver and plunger are in contact.



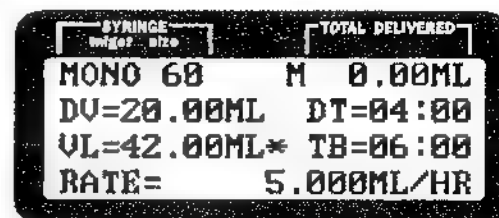
**WARNING:** Do not operate the pump in the prime function while connected to the patient. This could cause over-delivery of infusate or an infusion of air purged from the set.

**NOTE:** When priming, the occlusion alarm may occur if a small bore Mini-vol™ extension set is used. Intermittently press and release the PRIME key (versus pressing and holding it continuously) to alleviate this problem.

## STEP 10A: DELIVERY

Press the DELIVER key to begin the infusion. The LCD will not flash and the green LED DELIVER light begins to blink.

In the DELIVERY MODE, all keys are inactive except the ALARM ON/OFF key and the STOP/PROGRAM key.



## STEP 10B: RUNNING VOLUME (ONLY IF VL IS PROGRAMMED)

Press and hold the DELIVER key during delivery to display the RUNNING VOLUME (RV).

**NOTE:** The RV records volume delivered since the last VL reset. By comparing the RV to the VL, one can determine how much more fluid must be delivered before reaching the VL.

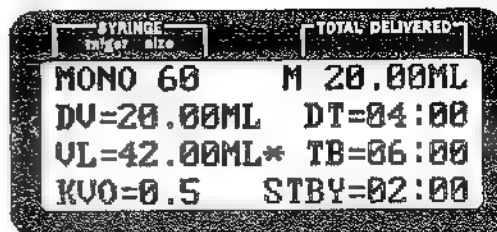
The RV is reset to zero when any of the following events occur: change in syringe size, occurrence of the empty alarm, reprogramming of the DV, DT and TB, when the VL is reached and the Prime is utilized.



## STEP 11A: STANDBY WITH KVO

After the pump delivers the DV over the DT, it enters the STANDBY mode. The STANDBY TIME displays the time remaining before the next infusion should begin. If a KVO rate is programmed, it will be in effect during the STBY time. The DELIVER LED continues to blink during the STBY time.

The STANDBY TIME of 2HRS indicates that the infusion just ended. The DELIVER LED continues to blink.



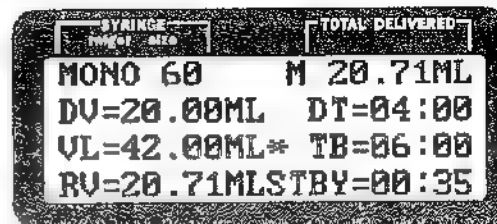
Press DELIVER to review RV if desired.

STANDBY TIMER continues to count down.

**NOTE:** When STBY equals 00:00, go to Step 11C



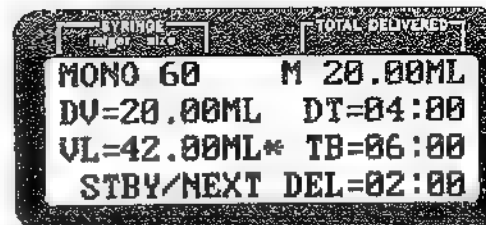
**WARNING:** If the "some" alarm selection was made in the custom program mode, the STOP/PROGRAM audio alarm was disabled, therefore an audio alarm will not occur when the STANDBY TIME elapses in the STANDBY MODE.



## STEP 11B: STANDBY WITHOUT KVO

After the pump delivers the DV over the DT, it enters the STANDBY MODE. The STANDBY TIME displays the time remaining before the desired start time of the next infusion.

When a KVO rate is not programmed, both the STOP/PROGRAM and DELIVER LEDs do not blink during the STBY TIME.





## STEP 11C: NEXT DELIVERY ALERT

When the STANDBY TIME equals 00:00, the DV will not be automatically given over to the DT. The STOP/PROGRAM LED blinks. The #1 audio sounds. Press DELIVER key to initiate the next delivery.



## STEP 12A: STOP DELIVERY

Press the STOP/PROGRAM key to stop the infusion. The STOP/PROGRAM LED blinks and a slow intermittent #1 audio alarm sounds.



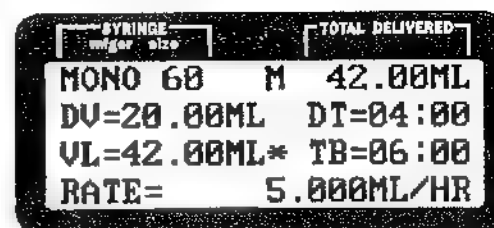
**NOTE:** Alarms (e.g., occlusion, depleted batteries, syringe pops out) interrupt delivery. Correct the alarm and press DELIVER key to resume. The remaining DV is given at the proper rate. If interruption of the delivery occurs during dose delivery, the running timer is suspended. The timer resumes when the delivery resumes. However, the running timer continues if the interruption occurs during the STANDBY TIME.



## STEP 12B: END OF DELIVERY - VOLUME LIMIT (VL) WITHOUT KVO

When the programmed VL is reached, the number 2 audio alarm sounds, the VL LED lights, the RV=VL, and the STOP/PROGRAM LED blinks indicating delivery cessation.

**NOTE:** The VL equals the TOTAL VOLUME DELIVERED readout only during the administration of the first infusion. To continue the infusion, press DELIVER. The VOLUME LIMIT ALARMS reset to zero (RV=0.0 ml) and resume when the programmed amount is again delivered. For example, if two VL amounts are delivered, the TOTAL VOLUME DELIVERED amount equals twice the VL amount.



## STEP 12C: END OF DELIVERY - VOLUME LIMIT WITH KVO

When the programmed VL is reached, the pump automatically switches to the KVO rate, the VOLUME LIMIT LED lights and a type 1 audio alarm sounds at the custom programmed alarm delay interval.

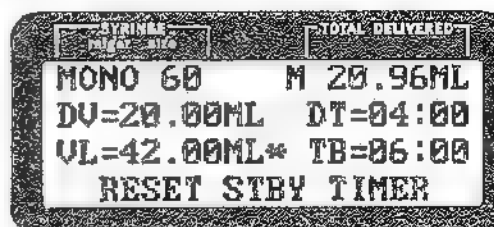
The pump continues delivery until the STOP/PROGRAM key is pressed or until the EMPTY alarm sounds.



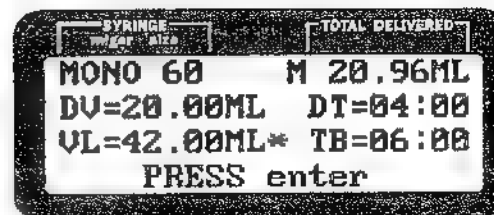
## STEP 13: RESET STANDBY TIMER

The STANDBY TIMER can be reset to zero so the next infusion begins immediately.

Press STOP/PROGRAM, then press the FUNCTION key.



The LCD alternates between "RESET STBY TIMER" and "PRESS ENTER". To reset the timer, press ENTER. Press DELIVER key to begin the next infusion.



# SECTION VI

## OTHER KEY FUNCTIONS

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### A. ALARM OFF/ON

To temporarily silence an audio alarm, press the **ALARM AUDIO OFF/ON** key. The alarm stops but the appropriate **LED** remains lit. After approximately 2 or 60 minutes, the audio alarm automatically turns back **"ON."** (The time delay of 2 or 60 minutes is custom programmed at the factory or by qualified biomedical personnel.) To accomplish reactivation of the audio alarm, press the **ALARM OFF/ON** key for a second time. **The only exception to this is the low battery alarm. If this alarm is silenced, it will not be reactivated in 2 or 60 minutes, i.e., the alarm OFF/ON permanently silences this alarm.**

**NOTE:** *The SYSTEM MALFUNCTION alarm is only silenced by turning off the main power.*

### B. RESET TOTAL VOLUME

The **RESET TOTAL DELIVERED** key is active only when the pump is in the **STOP/PROGRAM** mode. To **RESET** the **TOTAL DELIVERED** to 0.00, press the key. Each time the main power is switched **"ON,"** the **TOTAL DELIVERED** automatically zeros.

### C. REPROGRAMMING RATE

Press the **STOP/PROGRAM** key to stop the delivery. Press any **RATE** key to start the rate flashing (i.e. now programmable). Once the rate begins to flash, change to the desired rate. Commence delivery by pressing either the (1) **ENTER** key, then **DELIVER** key or (2) by pressing the **DELIVER** key twice.

Upon commencing delivery, the green **LED** blinks and all keys inactivate except **ALARM OFF/ON, BACKLIGHT** and **STOP/PROGRAM**.

### D. FUNCTION

In the **CONTINUOUS** and **VOLUME OVER TIME** modes, the **FUNCTION KEY** is used to program a standby time so an infusion may be temporarily discontinued.

In the **INTERMITTENT AUTO** and **INTERMITTENT MANUAL** modes, the **FUNCTION** key is used to reset the **STANDBY TIMER** to zero.

In addition, it is reserved for future software versions of the pump.

### E. BACKLIGHT

During battery operation, the **LCD** backlight will come on for about 15 seconds if the **BACK-LIGHT** key or any other key is pressed.

## ***OTHER KEY FUNCTIONS continued...***

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### **F. RATE SELECTION KEY**

Simultaneously pressing any two rate selection keys resets parameter to 0 in cases of inadvertent mis-entry.

### **G. PUMP POWER SWITCH**

In addition to turning pump on/off, this can serve as a means to erase inadvertent mis-entries so that correct parameters can be entered.

# SECTION VII

## ALARMS/ALERTS

---

### A. INTRODUCTION

The pump incorporates a series of ALARMS which are depicted in Table 1.

**NOTE:** Review Section VI-A for specifics on how the ALARM OFF/ON key functions.

### B. PROCEDURE FOR CORRECTING OCCLUSION ALARM

Troubleshoot by first checking for:

1. Kinks in tubing
2. Stopcocks and clamps which are turned off—prohibiting flow
3. Clotted IV catheter or needle
4. Something preventing movement of the Syringe Driver
5. Make sure syringe is not empty
6. For software versions lower than 1.4 with the Style 2 Track, check for correct syringe plunger replacement

By correcting the cause of the occlusion, the pressure is relieved and the pump restarts by merely pressing the DELIVER key.

**NOTE:** The pump *STOPS INFUSING* if an occlusion alarm occurs.

### C. PROCEDURE FOR CORRECTING SYSTEM MALFUNCTION

This alarm indicates that something has disrupted the operation of the microprocessor. Failures, which would activate this alarm, are over and under deliveries and electrical component failures.



**WARNING:** If this alarm occurs, remove the pump from service and consult the manufacturer. Also, record any operating data such as Total Volume Delivered, Infusion Rate, syringe manufacturer, syringe size, etc. Once the pump is turned OFF, this information is NOT retained.

### D. NEAR EMPTY ALARM

Generally, the NEAR EMPTY ALARM automatically sounds as 3 beeps approximately 10 minutes before the syringe becomes physically empty. The pump continues to deliver after the NEAR EMPTY alarm sounds. However, be aware of the following:

- If a volume limit is programmed and is less than the fluid in the syringe, the volume limit alarm will sound at the appropriate point and the infusion will stop. If a volume limit is programmed to be larger than the fluid remaining, a NEAR EMPTY alarm and EMPTY alarm will sound at the end of the syringe. No Volume Limit alarm will sound. If a volume limit value just slightly less than the volume of fluid in the syringe is programmed as a volume limit, the near empty alarm will sound, then the volume limit alarm may sound.

## ***ALARMS/ALERTS continued...***

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### **E. EMPTY ALARM**

The EMPTY ALARM'S actuation point is determined by a mathematical formula based on the Syringe Manufacturer and Syringe Size. Whenever an EMPTY ALARM sounds (Alarm #2), the operator should visually verify that the syringe in use is EMPTY. The operator must decide to terminate the infusion or replace the syringe with a new supply of infusate.

**NOTE:** *The pump stops delivering when the EMPTY ALARM SOUNDS. The audio #2 alarm may be temporarily silenced by pressing the ALARM OFF/ON key.*

If the syringe has any fluid remaining to deliver, restart the infusion by pressing the DELIVER key. The NEAR EMPTY ALARM will sound and when the syringe is empty you will receive a second EMPTY ALARM. **NOTE: THAT THE RV IS RESET BUT THE TOTAL VOLUME IS CUMULATIVE.**

### **F. SYRINGE POPS OUT**

This alarm occurs if the syringe is disturbed during the infusion. A type 3 or continuous alarm sounds and the fourth line of the LCD alternates between "PRESS enter" and "SYRINGE POPS OUT!"

To correct, confirm that the syringe is loaded properly, then press ENTER to verify syringe size. Press DELIVER to continue the infusion.

The audio alarm is temporarily silenced by pressing the ALARM OFF/ON key.

### **G. CHECK CLUTCH**

This alarm occurs if the clutch is not engaged to the SYRINGE DRIVER. A type 3 or continuous alarm sounds and the fourth line of the LCD alternates between "PRESS enter" and "CHECK CLUTCH!!"

To correct, make sure the clutch is fully engaged and that the syringe is properly loaded. Press "ENTER" to confirm clutch check and then DELIVER to continue the infusion. The audio alarm is temporarily silenced by pressing the ALARM OFF/ON key. If the clutch is manually disengaged for a period of time or the driver is manually moved during delivery a "CHECK CLUTCH" alarm results.

### **H. INVALID SIZE**

This alarm occurs if the syringe loaded on the pump is not the size which is stored in the pump. In addition, please note that the pump **cannot** distinguish between the same size syringe for different manufacturers.

To correct, confirm that the syringe manufacturer programmed is the same as the syringe being utilized. Also verify that the area between the syringe barrel and SYRINGE CLAMP is kept clear of labels, etc.

## ALARMS/ALERTS continued...

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### I. INVALID NUMBER

This LCD message occurs with entry of a parameter which cannot be accepted by the pump. Two beeps sound and the first valid number is displayed. For example: a rate too fast for the syringe selected, a volume limit greater than the volume of the syringe selected, if the Time Between Doses is less than or equal to the Delivery Time, in V/T where the desired delivery time is too fast for the volume chosen, etc.

### J. LOW BATTERY

The low battery alarm occurs approximately 30 minutes before battery depletion at rates of 5 cc/hr or less. The low battery LED lights and two beeps occur intermittently every 15 seconds. The audio alarm may be permanently silenced by pressing the alarm On/Off key once. The LED will remain on.

### K. OCCLUSION SENSING

The Medfusion 2001/2010 Syringe Pumps can operate at variable sensitivities to occlusion. The occlusion sensitivity set at the manufacturer (unless otherwise specified) is normal. Three other options exist for the force setting including "LOW", "MID", and "HIGH". The best options may be selected for the specific clinical application.

To change the force setting on the Model 2001/2010 Syringe Pumps consult the manufacturer, the service manual or Medex certified biomedical personnel.

For software version 1.4, if LOW, MID, HIGH are selected the syringe size will be followed by an L, M, H respectively so the operator will be able to identify the proper force table. For software versions 1.41 (and higher) MID has been changed to INT or I.

The PSI setting is theoretically derived. Generally the actual PSI will be lower than the theoretical value. The actual output pressure is affected by a multiplicity of factors including syringe size, friction between syringe barrel and plunger, catheter gauge, internal diameter of the tubing, durometer of the tubing, residual volume of tubing, rate of infusion, use of various in-line devices including stopcocks/filters/valves, etc.

For example, making changes to the force setting with use of a Monoject 35cc syringe affects the following:

Monoject 35cc syringe:		
Normal	11.0 force (lbs)	16.4 max theoretical psi
Low	4.0 force (lbs)	5.96 max theoretical psi
Middle	13.8 force (lbs)	20.5 max theoretical psi
High	15.0 force (lbs)	22.3 max theoretical psi

For further information on theoretical values for other syringe sizes/settings, please contact Medex's Technical Services.



**IMPORTANT:** Any setting may produce false occlusion alarms, however, in general the lower occlusion pressures are more likely to create false occlusion alarms.

## ***ALARMS/ALERTS continued...***

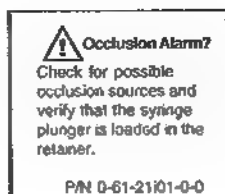
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### **L. PLUNGER SENSOR/OCCCLUSION**

Medfusion 2001 Syringe Pumps subsequent to serial number 33601 and all pumps that have had the plunger holder/track subassembly replaced with the plunger/track - 2 subassembly and the slide housing - 2 subassembly have a number of changes to the track subassembly. The retainer moves outward when the clutch is pinched. Additionally, dependent upon the software version, an alarm occurs when the plunger is not in place.

For software versions 1.4 and lower an "occlusion" alarm triggers during the size confirmation sequence in pump programming or during delivery if the plunger is not properly loaded. For software versions higher than 1.4, a LCD message "LOAD SYRINGE PLUNGER" occurs in the same scenario. In both cases, a continuous alarm occurs and the plunger should be placed into the retainer.

As with all occlusion alarm occurrences, the user should check for all sources of occlusion and for 1.4 software versions and lower, the lack of plunger placement should be considered as a source. The user is cued to do same via labelling as follows:





# TABLE I

## ALARM/ALERT GRID FOR MODEL 2001

ALARM OR ALERT	AUDIO (A)	TEMP. AUDIO OFF (B)	VISUAL LED (C)	AUTO. ADJUSTED	LCD MESSAGE	DEF. TO STOP/ PROG.	INFUSION AUTO. STOPS	WHAT TO DO
STOP/ PROGRAM	#1	YES	YES AT SWITCH (R)	N/A	NONE	N/A	YES	PROGRAM OR TURN PUMP OFF
NEAR EMPTY	#1	N/A	YES (Y)	YES - Approx. 10 min. from empty point	NONE	NO	NO	PREPARE TO TERMINATE INFUSION OR LOAD A NEWLY FILLED SYRINGE
EMPTY	#2	YES	YES (R)	YES	NONE	YES	YES	TERMINATE INFUSION OR LOAD A NEWLY FILLED SYRINGE
VOLUME LIMIT	#2	YES	YES (Y)	Programmed	NONE	YES	YES	TERMINATE INFUSION OR CONTINUE DELIVERY
OCCCLUSION	#3	YES	YES (R)	YES	NONE	YES	YES	CORRECT PROBLEM AND PRESS DELIVERY TO RESTART INFUSION <i>Verify that syringe plunger is loaded in the retainer - replace if misplaced.**</i>
SYSTEM MALFUNC.	#3	NO must turn off main power	YES (R)	NONE	SYSTEM ERROR	YES	YES	REMOVE UNIT FROM SERVICE AND CONSULT MANUFACTURER
LOW BATTERY	Two quick #1 with 15 sec. delays	* Permanent	YES (Y)	YES - Approx. 30 min. power remain	NONE	NO	NO	PLUG INTO MAIN AC AS SOON AS POSSIBLE
DEPLETED BATTERY	#3	YES	YES (R)	N/A	BAT. DEPL/ PLUG IN AC	YES	YES	Pump cannot infuse unless plugged into AC--Allow time for battery to recharge
BATTERY IN USE	NONE	N/A	YES (Y)	N/A	NONE	N/A	NO	INFORMATION ONLY
BATTERY CHARGING	NONE	N/A	YES (G)	N/A	NONE	N/A	NO	INFORMATION ONLY
SYRINGE POPS OUT	#3	YES	NO	N/A	SYRINGE POPS OUT!	YES	YES	RE-ENTER SYRINGE SIZE
PRIMING	#3 (16 second delay)	NO	NO	N/A	PRIME VOL=	N/A	N/A	N/A
DELIVER	NONE	N/A	YES AT SWITCH (G)	N/A	NONE	N/A	N/A	N/A
VALID KEY PRESS	ONE PECK	NO	N/A	N/A	N/A	N/A	N/A	N/A
CHECK CLUTCH	#3	YES	NO	N/A	CHECK CLUTCH!!	YES	YES	Press ENTER then DELIVER if alarm recurs, consult service manual or qualified biomedical personnel (See "D" below)
CHECK PLUNGER SENSOR	#2	NO	NO	N/A	CHECK PLUNGER SENSOR	N/A	N/A	Syringe plunger is not present while plunger detector is engaged

(A) ALARM AUDIO #1 IS SHORT BEEPS WITH LONG INTERVALS; #2 SHORT FAST BEEPS; #3 CONTINUOUS TONE  
 (B) TEMPORARY AUDIO OFF RESETS TO AUDIO ON AFTER 2 MINUTES OR 60 MINUTES (OFF-LINE PROGRAMMABLE) OR THE AUDIO CAN BE TURNED BACK ON BY PRESSING THE AUDIO OFF/ON KEY FOR A SECOND TIME.  
 (C) DENOTES LED COLOR (E.G. (G) GREEN; (R) RED; (Y) YELLOW).  
 (D) A CHECK CLUTCH ALARM OCCURS IF THE TRACK DOES NOT MOVE AT THE PROPER SPEED ACCORDING TO THE RATE SET ON THE PUMP. IF THE DRIVER IS MOVED MANUALLY DURING DELIVERY A CHECK CLUTCH ALARM OCCURS.

N/A = NOT APPLICABLE

\* Alarm will not react once alarm ON/OFF is pressed.

\*\* Only occurs in software versions 1.4 and lower with the Style 2 track. See page 58.

\*\*\* Only occurs in software versions higher than 1.4.

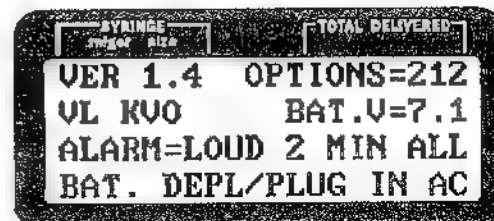
## SECTION VIII

# BATTERY POWER

- A. The pump's batteries simultaneously recharge while operating and while the pump is turned OFF but plugged into AC. The batteries cannot be overcharged. The BATTERY CHARGING LED indicates that electricity is reaching the batteries.
- B. If the LOW BATTERY LED lights and an audio alarm occurs while the pump is running, the pump should be placed on AC as soon as possible. However, the pump's operation is not compromised in any way while operating in the low battery state.
- C. If the pump is allowed to reach DEPLETED BATTERY, the LED will flash and #3 audio alarm will sound. The pump is no longer able to continue operating. To continue the infusion, the pump must be plugged into the wall.  
The LCD appears as described below.

- D. If a low or depleted battery condition exists upon turning the pump ON, the LCD will state:

The pump must be plugged into AC and the DELIVER key pressed before commencing operation.



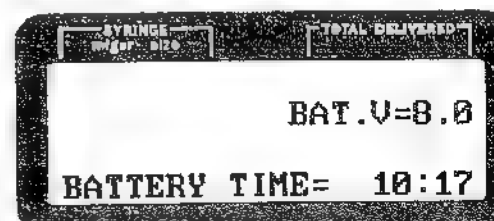
- E. The LCD backlight is normally off when the pump is operating on battery power. With activation of the BACKLIGHT key or any other key on battery power, the BACKLIGHT stays on for 15 seconds. The backlight is always lit when the pump is operating on AC power.
- F. To display the battery recharge time, press and hold both the STOP/PROGRAM and DELIVER keys, then turn the pump on.

Both the recharge time and battery voltage continuously display. The battery voltage displays after a 60 second delay.



### FOR EXAMPLE:

This display indicates the batteries have been recharging for ten hours seventeen minutes and the present battery voltage is 8.0.

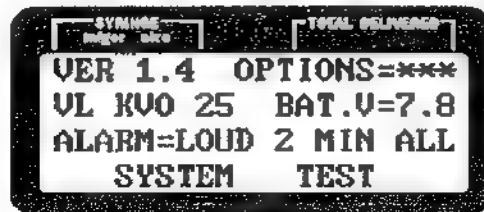


# SECTION IX

## BATTERY VOLTAGE

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- A. To check the charge status of the batteries
1. Unplug the AC adaptor
  2. Turn the pump ON
  3. Review the voltage stated on the LCD



A voltage greater than 8.2 volts indicates a nearly FULL CHARGE; however, the pump should be recharged for 16 hours to insure a FULL CHARGE. A voltage less than 7.3 volts indicates a LOW BATTERY condition.

# SECTION X

## IV POLE OR RAIL ATTACHMENT

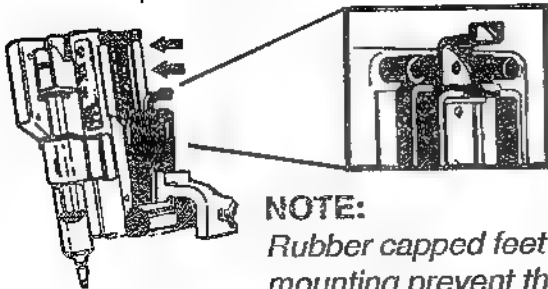
### A. INTRODUCTION

All pumps can easily accept the POLE CLAMP or the ROTATING POLE CLAMP using the procedures described below.

### B. ATTACHING POLE CLAMPS

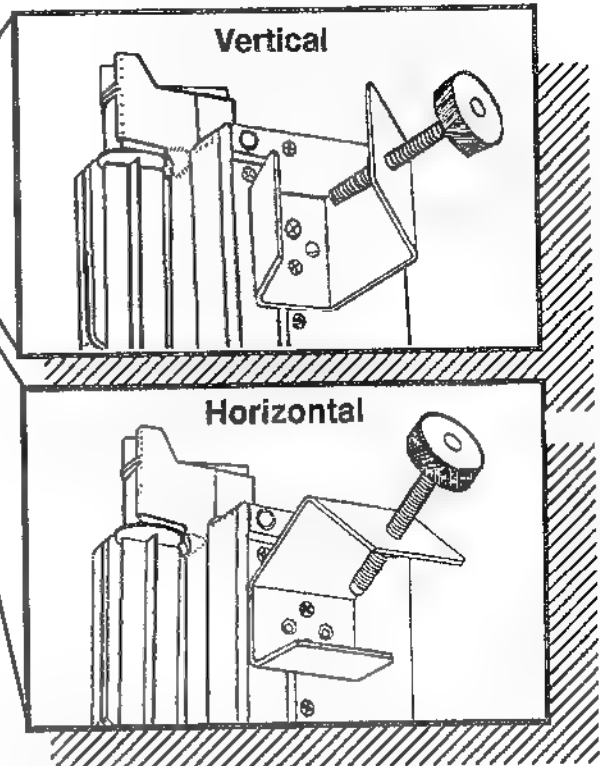
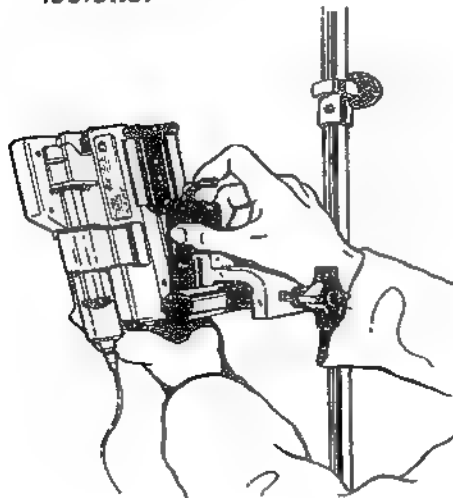
1. Orient the POLE CLAMP either vertically (for IV pole mounting) or horizontally (rail mounting). Use the two #6-32 flat head screws provided to secure the IV clamp to the back of the pump.

2. The ROTATING POLE CLAMP is designed to provide maximum flexibility when mounting or transporting your syringe pump. Special features include a quick release lock and full pump rotation capabilities.



#### NOTE:

*Rubber capped feet on the mounting prevent the pump from sliding when placed on a counter top or isolette.*



#### a. ATTACHING THE MOUNTING PLATE

The Pole Clamp Mounting Plate is secured to the pump with two flat head screws provided by the manufacturer.

#### b. ATTACHING AND REMOVING THE PUMP FROM THE POLE CLAMP ASSEMBLY

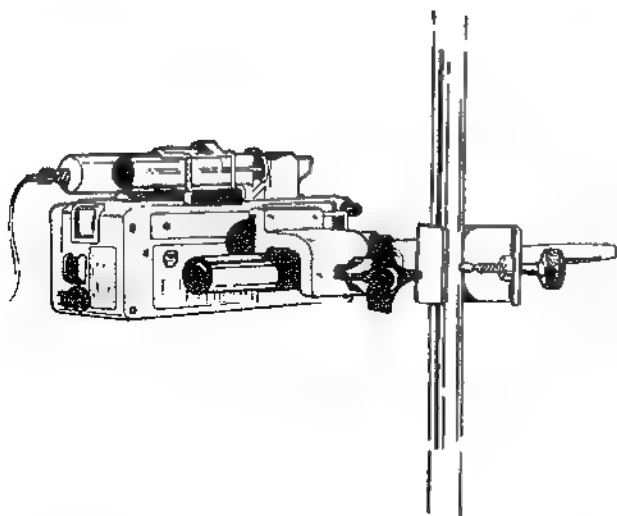
To attach the pump to the Pole Clamp Assembly, slide the Mounting Plate down into the grooves on the assembly until the Release Latch locks into place.

The pump may be quickly and easily removed from the assembly by gently pulling back on the Release Latch and sliding the pump up and out of the grooves.

## IV POLE OR RAIL ATTACHMENT *continued...*

### c. ROTATING THE PUMP ON THE POLE CLAMP

When attached to the Pole Clamp Assembly, the pump can be rotated to better suit its environment. To rotate the pump, grasp it firmly and turn it in the desired direction. You feel the pump stop and lock into four different positions: Straight Up, 90 degrees to the right, Up-side Down and 90 degrees to the left.

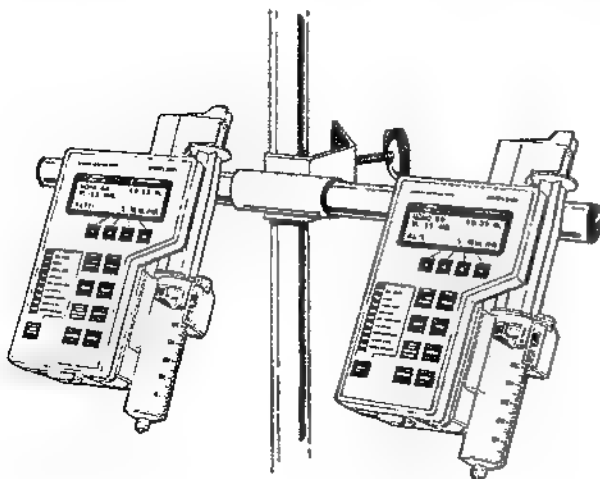


### d. PERMANENTLY ATTACHING YOUR PUMP TO THE POLE CLAMP

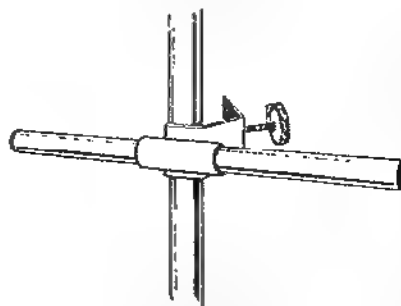
To permanently affix the pump to the Pole Clamp Assembly, slide the Mounting Plate into the assembly, then attach the entire unit to the pump with flat head screws (Consult Technical Services at manufacturer for further information).

### 3. ADDITIONAL ACCESSORY - CATALOG NO. 2001-TB

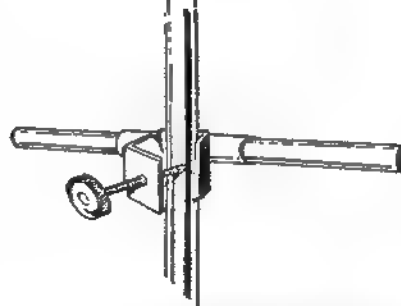
Also available from Medex is a "T" bar multiple pump pole mount pictured below. In addition to multiplying the capacity of one I.V. pole for the multiple pumps, it allows orientation of the Model 2001 Syringe Pump for easy visualization.



Front View



Back View



# SECTION XI

## PRECAUTIONS

---



### **WARNING**

1. This pump is for use only under the direction of qualified medical professionals.
2. Verify all programmed settings PRIOR to initiating delivery.
3. Verify that both the manufacturer of the syringe in use and the syringe size coincide with the information displayed on the LCD display.
4. Purge all air from the syringe and infusion lines BEFORE connecting to patient.
5. Do not place any labels on the syringe that will be covered by the syringe retainer clamp. This clamp must contact the syringe barrel without interference to ensure accurate syringe size sensing.
6. Do not use in presence of flammable anesthetics or explosive gases (i.e. in laboratories or in operating rooms where explosive gases are present).
7. Always use PRIME when mounting a newly filled syringe to remove any mechanical tolerances. Failure to do so may delay the delivery of the infusate and cause the TOTAL VOLUME DELIVERED display to read higher than actually delivered to the patient.
8. Medex recommends use of syringes as indicated in the General Specifications Section. Contact Medex for use of other syringes.
9. If the pump fails to perform as described herein, remove from service and consult Medex.
10. Selection of the "some" alarm option silences the audio component for the following alarm conditions: STOP/PROGRAM (includes standby mode), NEAR EMPTY, EMPTY and VOLUME LIMIT.
11. When an occlusion occurs and is corrected, there is a risk of infusing the pressurized build-up of infusate. To avoid inadvertent bolus relieve pressure before restarting the infusion.
12. Verify that the syringe manufacturer on the LCD is the same as the syringe in use. Failure to use the listed manufacturer could result in inaccurate delivery. The pump cannot automatically identify syringe manufacturer.
13. Always confirm that the syringe size stated on the LCD agrees with the size of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.
14. If the B-D luer lock option was selected in custom programming, the operator must select the appropriate syringe size (i.e., 1cc or 3cc). The pump cannot distinguish between these syringe sizes.

## ***PRECAUTIONS continued...***

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15. If the pump has been dropped or damaged, it must be thoroughly examined and tested to assure that it is functioning properly. Failure to do so could result in either under or over delivery of medication along with the resulting consequences.
16. Do not expose the pump to strong magnetic fields as it may affect pump function.
17. It is recommended that this pump not be used in situations where the syringe is connected to a system much lower than atmospheric pressure (i.e., negative pressure below -100mmHg). At certain pressures, the plunger could be pulled from the retainer resulting in a siphoning situation and the resulting complications of an overdelivery, which could include serious injury or death.



### **CAUTION:**

1. For all syringe sizes, be sure the finger tabs of the syringe are correctly engaged in the syringe clamp groove (retainer) and the syringe saddle. If not properly engaged, the pump may alarm after it has been in the deliver mode for a period of time.
2. Do not allow fluids to enter the Model 2001. Immediately wipe off all spills.
3. The TOTAL VOLUME DELIVERED and the VOLUME LIMIT use separate counters.
4. Do not use organic solvents to clean the pump. Use only those agents listed under "cleaning" to clean and disinfect the pump. Use of unapproved agents could damage the pump (See cleaning agent section).
5. Do not autoclave or subject the pump to temperatures which exceed 50 degrees C.
6. Use only those drugs which are compatible with the disposable syringe selected and the existing environmental conditions.
7. Verify that the model number and software version of the pump and the operations manual agree.
8. In the volume/time mode, the pump may be programmed to deliver as little as 0.05 ml, however, the calculated rate must be greater than or equal to the minimum allowable rate for that particular size of syringe.
9. In consideration of how syringe pumps operate, clinicians should consider use of appropriate syringe, tubing, and in-line devices for the given application and the drug being infused. Certain factors enhance multiple characteristics of syringe pump infusion such as time to detect an occlusion, visual verification of volume delivered, continuity of flow, time to reach the set rate. Following are considerations requiring discretion by clinicians using syringe pumps. (Typically, this is most important with continuous injections of short half-life drugs.)

## ***PRECAUTIONS continued...***

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- a. Select the smallest syringe size appropriate for the intended application. Friction within the syringe (between the plunger rubber tip and the barrel) can affect the continuity of flow and the time required to attain the set infusion rate; the plunger tip expands and relaxes throughout the infusion, particularly with larger syringes at slower rates. The best case is to use smaller syringes at higher rates.
  - b. Do not use a 60 cc syringe for rates of 2.0 cc/hour or less. Such use is generally not recommended when using a syringe pump.
  - c. Connect the syringe pump tubing at the closest point to the patient for more predictable and accurate delivery of the fluid.
  - d. Use small internal diameter, high hardness tubing and no in-line devices for best results at low rates.
10. A routine preventive maintenance schedule should be followed according to the policy defined by the individual hospital. Presently, Medex recommends that these procedures be performed as indicated in the Service Manual. Additional routine cleaning and inspections should be performed on an as needed basis (i.e., droppage, fluid contamination, suspect malfunction, etc.).



### **IMPORTANT:**

On the front of this manual is a revision date. If the date is over three (3) years, please contact Medex to see if additional information related to this product is available.



## SECTION XII

# CLEANING

The pump housing may be cleaned with the following agents:

AMMONIA and 97% water  
CLOROX and 90% to 95% water  
CONTROL III (by Maril Products, Inc.)  
COLD SPOR (by Metrex Research Corporation)  
DETACHOL (by Fernadale Laboratories, Inc.)  
ENVY (by S. C. Johnson & Son, Inc.)  
ENZOL (by Johnson & Johnson Medical, Inc.)  
ETHYL ALCOHOL 95% (190 proof)  
HARCO TINCTURE OF GREEN SOAP (by Harley  
Chemicals)  
ISOPROPYL ALCOHOL 70% (rubbing alcohol)  
ISOPROPYL ALCOHOL 70% and 10% ACETONE

LpH, se (by Calgon Vestal Laboratories)  
MANU-KLENZ (by Calgon Vestal Laboratories)  
METRIZYME (by Metrex Research Corporation)  
MILD SOAP AND WATER SOLUTION  
NUTRA-pH (by Snowden-Pencer)  
SANI-CLOTH (by distributor: Professional  
Disposables, Inc.)  
SEPTISOL (by Calgon Vestal Laboratories)  
SPORICIDIN (Sporicidin, International)  
TOR-II (by Huntington Laboratories, Inc.)  
WISK ADHESIVE REMOVER PAD (by Baxter  
Healthcare Corporation)



This is the way we wash our pumps  
Wash our pumps,  
Wash our pumps!



### CAUTION:

Recommendations for agents applies to compatibility of agent with the plastic housing and is not based on the cleansing/disinfecting ability or effectiveness. Medex makes no representations as to any agent's ability to cleanse or disinfect. We defer to the guidelines of the manufacturer for mixing instructions for agents listed.



### WARNING:

Do not use solutions containing strong detergents, organic solvents, quarternary ammonium or ammonium chloride to clean any portion of the pump, as serious damage could result. **DO NOT IMMERSE.** Avoid spills and inadvertent allowance of fluid in the pump housing.

## **SECTION XIII**

# **SERVICE AND LIMITED WARRANTY**

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### **LIMITED WARRANTY**

MEDEX, Inc. warrants to the purchaser that the Syringe Infusion Pump shall be free from defects in material and workmanship for a period of one (1) year from the date of purchase. MEDEX'S sole obligation with respect to any such defect is limited to the repair, or at MEDEX's option, replacement of the Syringe Infusion Pump. Purchaser pays return freight charges.

This limited warranty is made on the condition that prompt notification of a defect is given to MEDEX, within the warranty period, and that MEDEX shall have the sole right to determine whether a defect exists.

This limited warranty does not apply to Syringe Pumps that have been partially or completely disassembled, altered, subjected to misuse, negligence, or accident; or operated other than in accordance with the instructions provided by MEDEX.

This limited warranty represents the exclusive obligation of MEDEX, and the exclusive remedy of the purchaser regarding defects in a Syringe Infusion Pump. THIS WARRANTY IS GIVEN IN LIEU OF ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. No person is authorized to modify, in any manner, MEDEX'S obligation as described above.

MEDEX reserves the right to make changes in or additions to pumps manufactured and/or sold by MEDEX at any time, without incurring any obligation to make the same or similar changes on pumps previously manufactured or sold by MEDEX.

## ***SERVICE AND LIMITED WARRANTY continued...***

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### **SERVICE**



#### **CAUTION:**

The syringe pump should not be serviced by any personnel who have not attended the 2000 Series Service School.

Other than cleaning, maintenance must be performed by qualified biomedical personnel at the institution or at manufacturer. For questions on repair, service or maintenance of our pumps, please call our **TECHNICAL SERVICE DEPARTMENT** at **1-800-648-0840**.

When returning a pump for service, please consider the following:

- Call Technical Services at 1-800-648-0840 to obtain a RETURN AUTHORIZATION (will need serial number, model number, p.o. #, other pertinent information related to the reason for return).
- Decontaminate the pump or accessory prior to returning to the manufacturer (according to O.S.H.A. guidelines).

**NOTE:** *If OSHA guidelines are not followed, original packaging cannot be returned.*

- Package unit in original packaging or other appropriately protective shipping container.
- Indicate the Return Authorization Number on the outside of the packaging.
- Ship to **MEDEX** via preferred method (at your cost). Indicate preferred method of return.

# APPENDIX I

## FLOW RATES

SYRINGE SIZE	MFGR	ML PER HR (In Tenths)		ML PER HR (In Hundredths)	
		Maximum	Minimum	Maximum	Minimum
1.0	B-D	11.00	0.01	11.00	0.01
1.0	Mono	11.00	0.01	11.00	0.01
1.0	Teru	11.00	0.01	11.00	0.01
1.0	BD-G	11.00	0.01	11.00	0.01
3.0	B-D	36.00	0.01	36.00	0.01
3.0	Mono	39.60	0.01	39.60	0.01
3.0	Teru	39.60	0.01	39.60	0.01
3.0*	BD-G	36.00	0.01	36.00	0.01
5.0	B-D	70.00	0.01	70.00	0.01
6.0	Mono	80.80	0.01	80.80	0.01
5.0	Teru	80.80	0.01	80.80	0.01
5.0	BD-G	70.00	0.01	70.00	0.01
5.0	BBM	80.00	0.01	80.00	0.01
10.0	B-D	104.0	0.1	99.00	0.1
12.0	Mono	126.0	0.1	99.00	0.1
10.0	Teru	126.0	0.1	99.00	0.1
10.0	BD-G	104.0	0.1	99.00	0.1
10.0	BBM	128.00	0.1	99.00	0.1
10.0	Fres	130.00	0.1	99.00	0.1
20.0	B-D	182.0	0.1	99.00	0.1
20.0	Mono	207.0	0.1	99.00	0.1
20.0	Teru	207.0	0.1	99.00	0.1
20.0	BBM	205.0	0.1	99.00	0.1
30.0	B-D	234.0	0.1	99.00	0.1
35.0	Mono	285.0	0.1	99.00	0.1
30.0	Teru	270.0	0.1	99.00	0.1
30.0	BD-G	280.0	0.1	99.00	0.1
50/60	B-D	355.0	0.1	99.00	0.1
60.0	Mono	356.0	0.1	99.00	0.1
60.0	Teru	378.0	0.1	99.00	0.1
50.0	Abot	360.0	0.1	99.00	0.1
60.0	BBM	370.0	0.1	99.00	0.1
50.0	Aboi	360.0	0.1	99.00	0.1
60.0	BBM	370.0	0.1	99.00	0.1
50.0	Fres	400.0	0.1	99.00	0.1
60.0	Perf	375.0	0.1	99.00	0.1

**NOTE:** If a MAXIMUM RATE was custom programmed, the following are true:  
(NOTE: MAXIMUM RATE only affects the continuous rate mode.):

1. All syringe sizes can be programmed in hundredths.
2. A rate higher than the MAXIMUM RATE cannot be entered. If attempted, the LCD states INVALID NUMBER.

\* A 2.5 ml B-D glass syringe is recognized in the software as a 3 ml syringe;  
therefore, 3 ml is the selection option for a 2.5 ml B-D glass syringe.

# APPENDIX II

## DEFINITIONS

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**Alarm Temporary Delay Time:** A custom programmed delay time of either 2 or 60 minutes that is activated when the alarm key is pressed once.

**Alarm Volume:** A program option in the CP mode that allows variance of the alarm auditory volume as either loud or soft.

**Continuous Infusion Mode:** A level of pump operation that allows delivery of a specific fluid volume at a specified rate. (Useful in delivery of a volume of medication at a specific constant rate.)

**Custom Program Mode (CP):** A level of pump operation that is limited in access by a lockout feature and generally only accessed by healthcare professionals or biomedical engineers to preprogram or customize the pump by selection of the infusion modes, the maximum infusion rate, the alarm volume, the alarm temporary delay time, volume limit, KVO rate, and alarm types.

**Delivery Mode:** The level of pump operation during which the infusion occurs as initiated by pressing the DELIVER key and indicated by the blinking of the green LED DELIVER Key light. All keys except the ALARM OFF/ON key and STOP/PROGRAM key are inactivated.

**Delivery Time (DT):** Time in hours and minutes for the dose volume to be delivered.

**Dose Volume (DV):** Volume (in mls) of dose to be administered (the same as volume limit in the volume/time mode).

**Intermittent Auto:** A level of pump operation that automatically delivers a specific dose volume over a specified delivery time at intervals established by programming the time between. (Useful for automatic delivery of multiple doses.)

**Intermittent Manual:** A level of pump operation that delivers a specific dose volume over a specified delivery time at intervals established by programming the time between. However, delivery is not automatic—it must be manually initiated. (Useful in manual delivery of multiple doses.)

**Invalid Number:** A LCD parameter that indicates what has been programmed is not consistent with other values entered. The highest possible entry that is programmable will be displayed (e.g., if a VL is entered that exceeds the syringe capacity, the display will show the highest value programmable for the syringe selected).

**KVO Rate (KVO):** A custom program feature that preprograms a specific "keep vein open" rate to be delivered once the specified volume limit is delivered. (Note: If the KVO exceeds the programmed rate, the pump automatically defers to the lower rate and a KVO cannot be programmed if a VL was not.)

**Light Emitting Diode (LED):** A red, yellow or green light function on the front panel of the pump.

**Liquid Crystal Display (LCD):** The pump screen.

## ***DEFINITIONS continued...***

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**Maximum Infusion Rate:** A custom program mode parameter that limits the acceptable programmable rate to the value programmed in the continuous mode. (Allows programming to hundredths of a ml.)

**Prime:** A level of pump operation that is only activated in the program mode when all another functions have been entered. Priming allows the fluid to be delivered to replace air in the tubing attached to the syringe. The actual priming volume can be verified on the prime volume counter of the LCD. The prime function also eliminates any mechanical slack whenever a newly filled syringe is loaded onto the pump.

**Running Volume (RV):** A recording of total volume delivered since the last volume limit reset. The volume limit minus running volume equals the volume yet to be delivered.

**Standby Mode:** The level of pump operation occurring between the completion of one intermittent dose and the beginning of the next intermittent dose. If a KVO rate has been programmed, it will be in effect during this mode.

**Standby Time:** The time (in hours/minutes) on the LCD display during the standby mode that represents the time remaining before the next infusion begins.

**Time Between (TB):** A program parameter in the intermittent automatic and manual modes that represent the interval between doses including the dose time in hours and minutes (e.g., for an antibiotic ordered to be infused every 8 hours over 30 minutes, the TB is 8 hours not 7:30).

**Total Volume Delivered:** Refers to the amount of medication actually delivered during the course of an infusion (however, does not include the volume delivered in the priming mode).

**Volume Limit (VL):** A custom program feature that preprograms a specific fluid volume to be delivered from any size syringe. Once that limit is delivered, the pump stops.

**Volume/Time Mode:** A level of pump operation that delivers a specific dose volume over a specified delivery time (useful in delivery of a single dose over a specific time).

**User Mode:** A level of pump operation that is available to the user of the pump. Level of operation can be limited by custom programming or can allow the user full access to program.

# APPENDIX III

## CUSTOM PROGRAM MODE

The Custom Program Mode (CP) allows customization by the selection of the infusion modes, the maximum infusion rate, the alarm volume, the alarm temporary delay time, volume limit, KVO rate and alarm types. Entry into this mode is limited due to the lockout feature. This mode generally is utilized by health-care professionals and biomedical engineers to initially preprogram the pump prior to routine clinical use. Once the pump is programmed in the CP mode, go to Sections V and VI for normal operating instructions.

### STEP 1: ENTERING THE CUSTOM PROGRAM (CP) MODE

#### STEP 1A: ENTER CP MODE

To enter the **CP Mode**, press and hold down, at the same time, the **SELECT** and **ENTER** keys then turn the pump ON with the power switch.

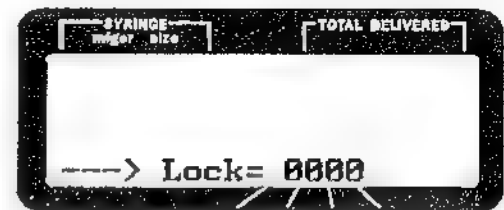
The **LCD** display should be blank.



#### STEP 1B: REQUESTING LOCKOUT CODE ACCESS

Release the **SELECT** and **ENTER** keys to visualize the **LOCK CODE** as shown.

The 4 zeros flash indicating they can be programmed.



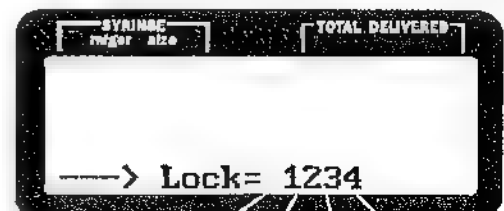
#### STEP 1C: ENTER LOCKOUT ACCESS CODE

Program the access code **1234** by using the appropriate **RATE SELECTION** keys.

**NOTE:** An inadvertent mis-entry can be corrected by pressing any two rate keys simultaneously which converts the display to zeros.

Press **ENTER** to enter the code. The pump will automatically advance to the **CP Mode** if a valid code is entered.

An erroneous code denies access to the **CP Mode**



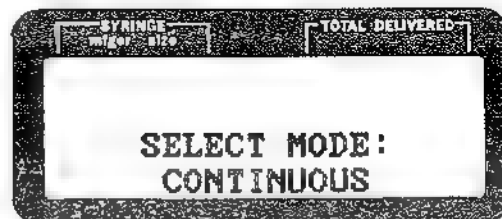
## ***CUSTOM PROGRAM MODE continued...***

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### **STEP 2: PREPROGRAMMING DELIVERY MODES**

#### **STEP 2A: CONTINUOUS INFUSION**

The flashing **LCD** identifies the **CONTINUOUS** pump delivery mode.



Press **ENTER** to access the **CONTINUOUS** mode.

**OR**

Press **SELECT** to eliminate access to the **CONTINUOUS** mode.

The **LCD** automatically advances to the next choice.



#### **STEP 2B: VOLUME/TIME**

The flashing **LCD** identifies the **VOLUME/TIME** pump delivery mode.



Press **ENTER** to access the **VOLUME/TIME** mode.

**OR**

Press **SELECT** to eliminate access to the **VOLUME/TIME** mode.

The **LCD** automatically advances to the next choice.





## ***CUSTOM PROGRAM MODE continued...***

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### **STEP 2C: INTERMITTENT AUTOMATIC**

The flashing **LCD** identifies the **INTERMITTENT AUTOMATIC** pump delivery mode.



Press **ENTER** to access the **INTERMITTENT AUTOMATIC** mode.

**OR**

Press **SELECT** to eliminate access to the **INTERMITTENT AUTOMATIC** mode.

The **LCD** automatically advances to the next choice.



### **STEP 2D: INTERMITTENT MANUAL**

The flashing **LCD** identifies the **INTERMITTENT MANUAL** mode.



Press **ENTER** to access the **INTERMITTENT MANUAL** mode.

**OR**

Press **SELECT** to eliminate access to the **INTERMITTENT MANUAL** mode.

The **LCD** automatically advances to the next choice.

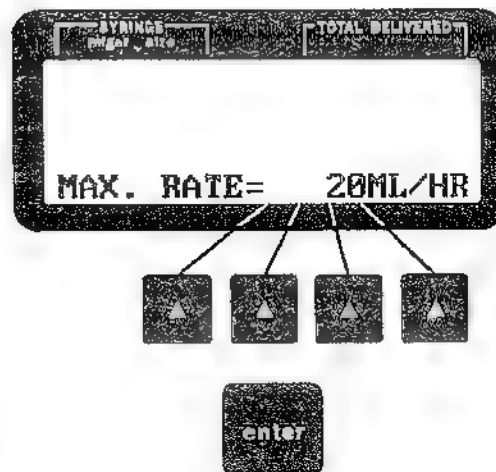


## CUSTOM PROGRAM MODE continued...

### STEP 3: PROGRAMMING MAXIMUM RATE (ONLY IF CONTINUOUS MODE SELECTED)

#### STEP 3A: PROGRAMMING A MAX RATE:

- Allows programming in hundredths of a ml per hour for all syringe sizes (See Appendix I).
- Limits the acceptable programmable rate in the **CONTINUOUS MODE** to the value programmed.
- Sets a **MAX RATE** in the Continuous Mode only.



#### STEP 3A1: ENTER DESIRED VALUE (01 TO 99 ML/HR) FOR MAX RATE WITH THE APPROPRIATE RATE SELECTION KEYS.

#### STEP 3A2: PRESS ENTER TO PROGRAM THE DESIRED VALUE.

- The **LCD** automatically advances to the next screen. Go to Step 4.

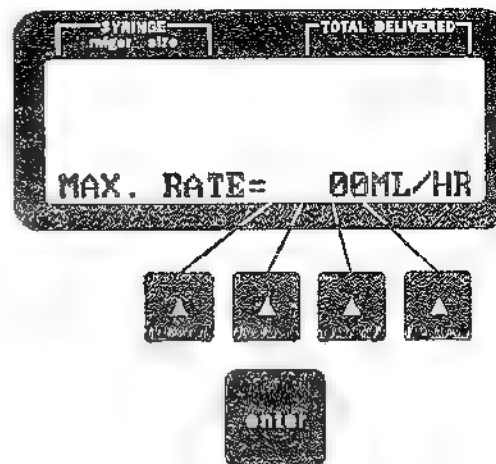
#### STEP 3B: PROGRAMMING THE MAX RATE AS 00.

- Limits the rate to tenths of a ml/hr for syringe sizes larger than 6 ml.

#### STEP 3B1: ENTER 00 AS THE MAX RATE WITH THE APPROPRIATE RATE SELECTION KEYS.

#### STEP 3B2: PRESS ENTER TO PROGRAM THE DESIRED VALUE.

The **LCD** automatically advances to the next screen.



## ***CUSTOM PROGRAM MODE continued...***

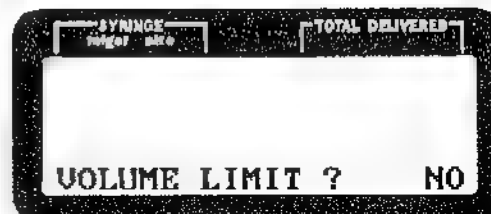
### **STEP 4: PROGRAMMING VOLUME LIMIT**

Selection of this option allows the user to pre-program a specific fluid volume to be delivered from a particular syringe in the operation mode. Once that limit is delivered, the pump stops. The **VL** may be programmed in hundredths of a cc for all syringe sizes.

The **LCD** queries use of **VOLUME LIMIT**.

The **SELECT** key toggles between **YES** and **NO**.

Press **ENTER** to program choice.



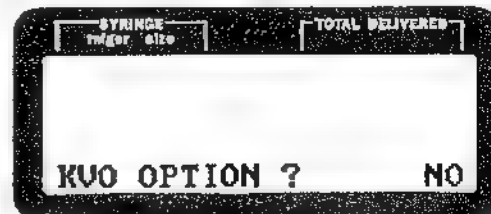
### **STEP 5: PROGRAMMING KVO**

Selection of this feature preprograms a specific "keep vein open" rate to be delivered once the specified volume limit is delivered in the operation mode. The **KVO** rate cannot exceed the primary rate and cannot be programmed if a **VL** was not programmed.

The **LCD** queries the **KVO** option.

The **SELECT** key toggles between **YES** and **NO**.

Press **ENTER** to program choice.



## ***CUSTOM PROGRAM MODE continued...***

### **STEP 6: ALARM OPTION**

The LCD queries the **ALARM** option.

The **SELECT** key toggles between **SOME** and **ALL**.

Press **ENTER** to program choice.

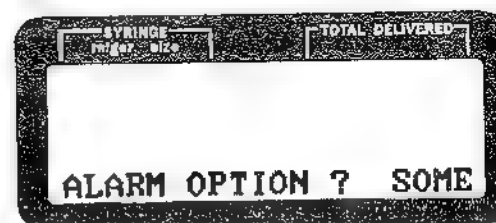
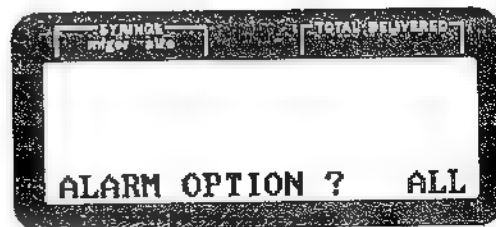


#### **WARNING:**

Selection of the **"SOME"** alarm option silences the audio component for the following alarm conditions:

**STOP/PROGRAM (includes standby mode)  
NEAR EMPTY  
EMPTY  
VOLUME LIMIT**

The **SELECT** key toggles between **SOME** and **ALL**.

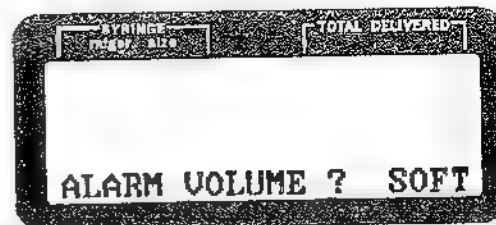
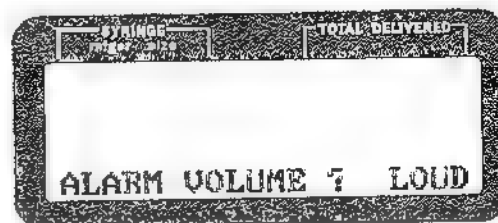


### **STEP 7: ALARM VOLUME OPTION**

The LCD will display the options for the alarm volume.

The **SELECT** key toggles between **LOUD** and **SOFT**.

Press **ENTER** to program choice.



## CUSTOM PROGRAM MODE continued...

### STEP 8: PROGRAMMING ALARM DELAY

The LCD queries alarm delay options.

**NOTE:** The delay time is activated when the alarm off/on key is pressed.

The **SELECT** key toggles between a 2 minute and a 1 hour delay time.

Press **ENTER** to program choice.



### STEP 9: PROGRAMMING SYRINGE MANUFACTURER

The LCD displays the options for each syringe manufacturer according to software version which may include: **B-D, MONO, TERU, BBM, FRES, PERF, BD-G or ABOT.**

Press **SELECT** to eliminate access to a given manufacturer in the operation mode.

**OR**

**ENTER** the desired manufacturer(s).

**NOTE:** Multiple manufacturers may be entered.



## CUSTOM PROGRAM MODE continued...

### STEP 10: SELECTION FOR B-D LUER LOCK SYRINGE

The **LCD** queries use of the Luer Lock B-D 1 cc syringe.

The **SELECT** key toggles between **YES** and **NO**.

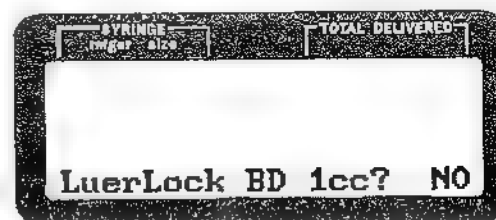
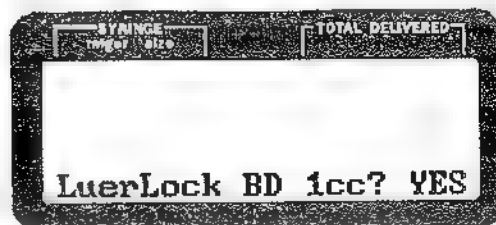
Press **ENTER** to program choice.

The pump automatically exits the custom program mode and enters the operation mode.



#### **WARNING:**

If **YES** is entered in the query for use of the B-D Luer Lock 1 cc syringe, the operator must select the appropriate syringe size (i.e., 1 cc or 3 cc). The pump cannot distinguish between these syringe sizes.



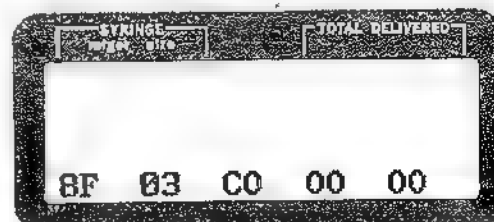
### VERIFY BATCH SETTINGS

The purpose of the code is to allow quick verification of the custom program settings from one pump to the next. If there is a discrepancy, it indicates some difference in custom programming.

Hold the **PRIME** key down and turn the pump on.

The custom program features in hexadecimal code will appear on the last line of the **LCD**. This code will be unique for each custom setup.

Press any key to continue programming in the operation mode.



(EXAMPLE ONLY)

# APPENDIX IV

## USE OF B-D LUER LOCK SYRINGES IN THE OPERATION MODE

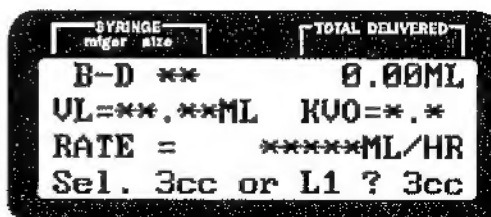
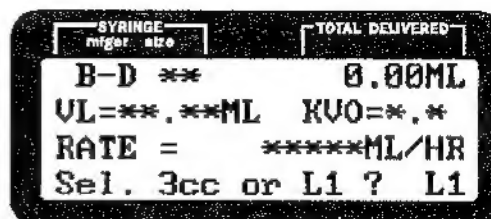
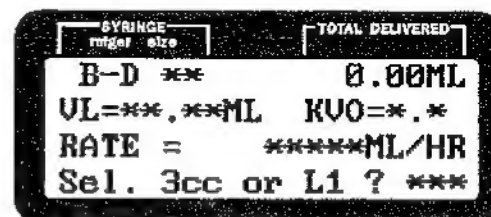
If B-D Luer Lock 1 cc syringes are utilized with the Medfusion 2001 Syringe Pump, the option for this selection must be made in custom programming.

The **LCD** only queries the use of the B-D Luer Lock 1 cc syringe if it is custom programmed and if a 3 cc or 1 cc Luer Lock syringe is loaded.

The **SELECT** key toggles between 3 cc and L1 (Luer Lock 1 cc).

Press **ENTER** to confirm choice.

Continue programming for delivery once selection is made.



### **WARNING:**

Always confirm that the syringe size and manufacturer stated on the LCD agree with the size and manufacturer of the syringe loaded on the pump. Failure to select the correct syringe size will result in inaccurate delivery.









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